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ELECTRICAL WORLD

SEPTEMBER 12, 1931

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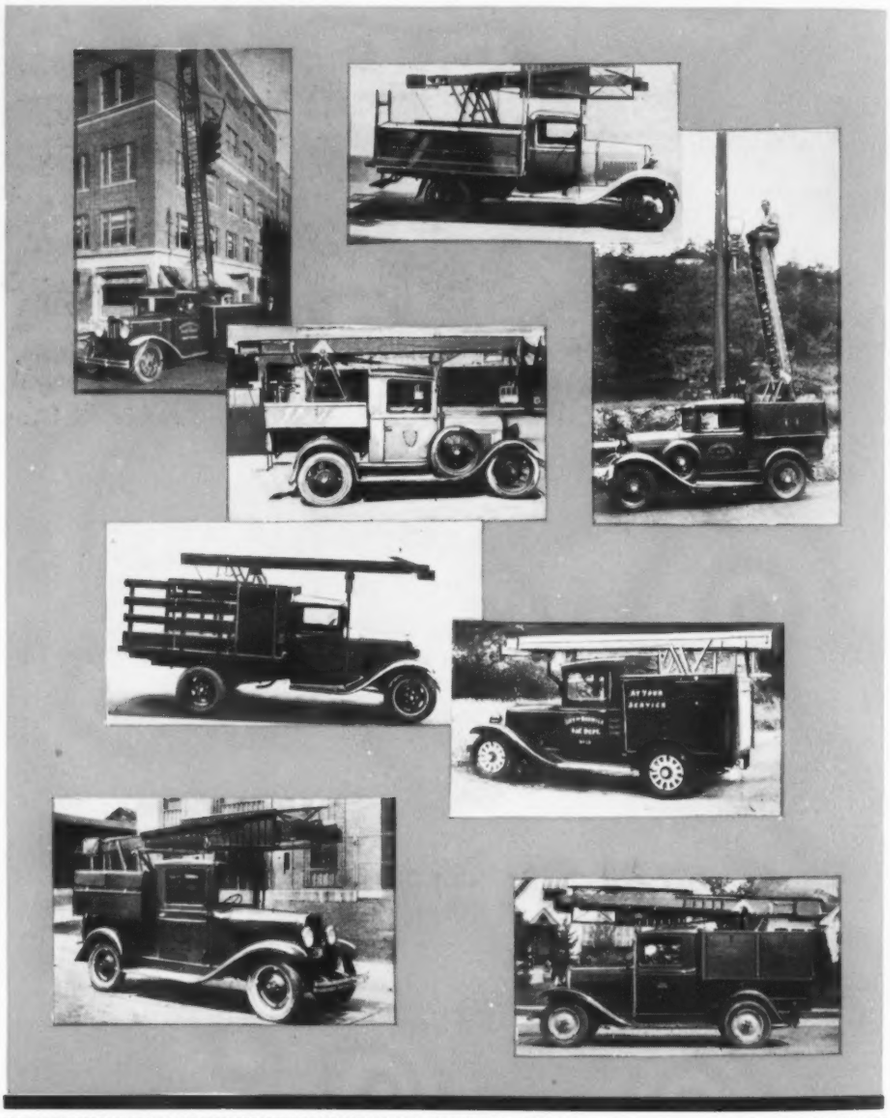

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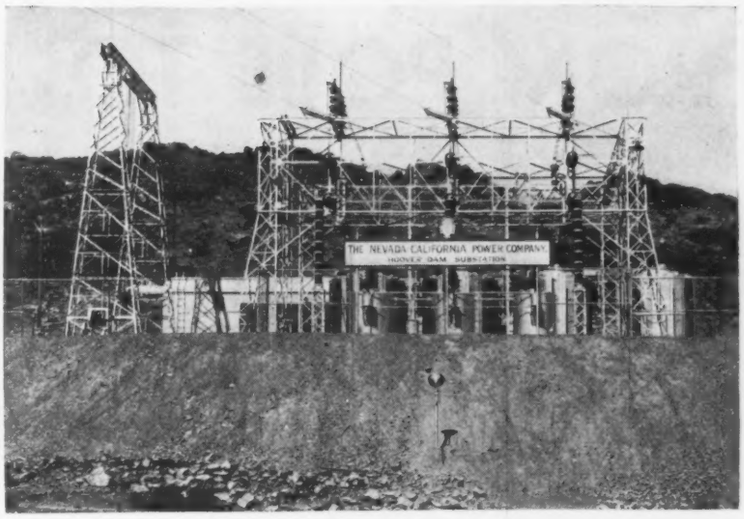

Hoover Dam substation
Nevada-California
Power Co.

SEPTEMBER 12, 1931

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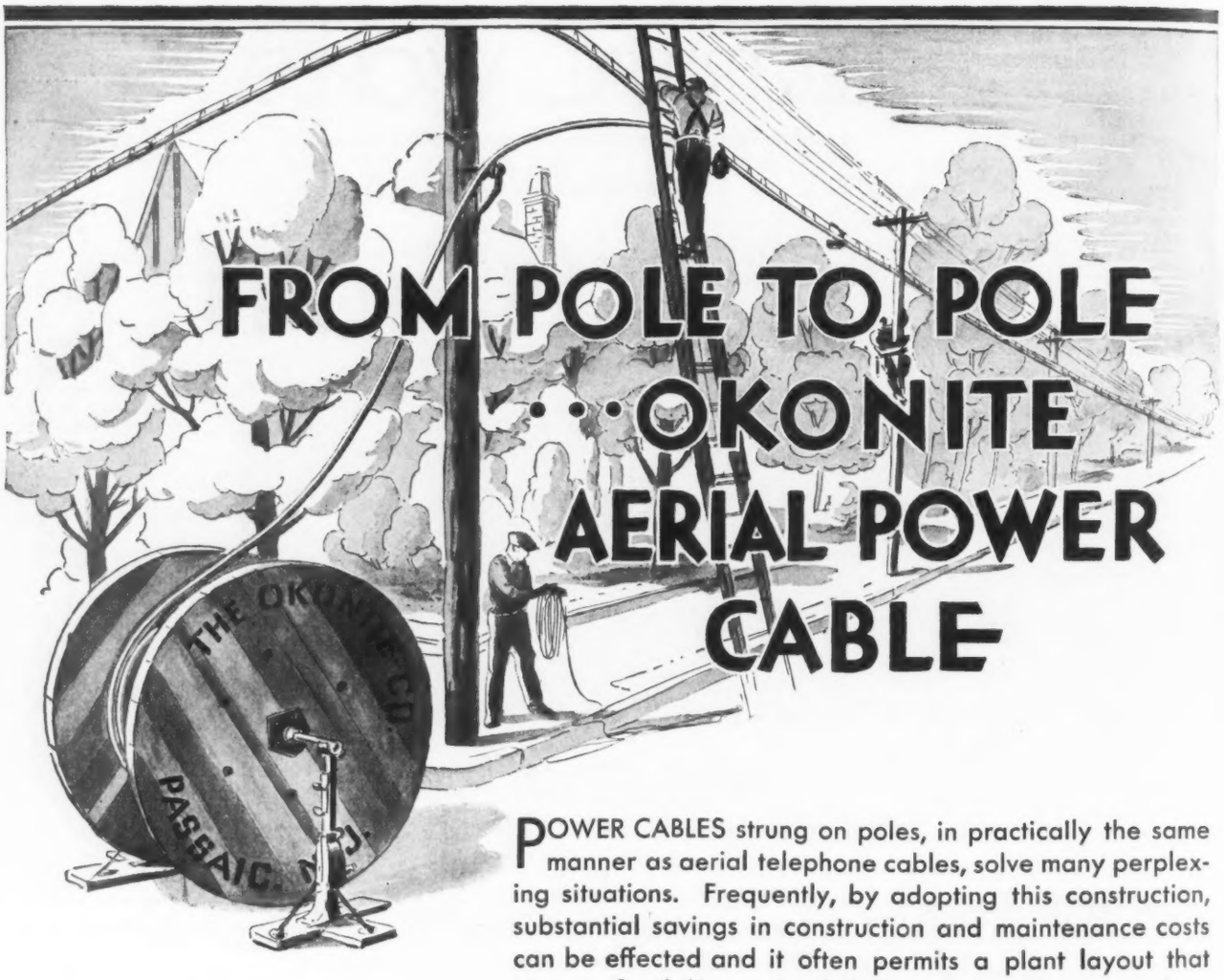

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ELECTRICAL WORLD

for the Week Ending

September 12, 1931

Let us face the present unpleasant facts calmly and with courage. Let us be honest with ourselves. There is no panacea for the present ills of all industry. The desired objectives may be accomplished only by hard, consistent, endless work by us as individuals. There is no short cut and we all know that is the truth.

A. W. ROBERTSON,
Chairman Westinghouse Electric & Manufacturing Company

Dissent over New York City rates

—**Protests rise over the rates** established by commission-utility negotiations after ten months of consideration. Users of energy complain of major increases in bills. Case to be reopened—*p. 444.*

—**Miniature switchboard values** enumerated by design engineer who shows that advantages of compactness and flexibility must be balanced against control-cable lengths and costs—*p. 462.*

Lighting load offers best prospects?

—**Home lighting sales beckon** as the easiest and best business possibility of the electrical industry. Available market of $1,200,000,000 analyzed in detail to show once more that we haven't begun to light— *p. 464.*

—**Ford favors the a.c. drives.** Recent substitution of alternating-current equipment for 27,000 d.c. units was the outcome of a factual study of maintenance costs, plant distribution losses and performance —*p. 452.*

An improved cost-finding basis

—**Distribution costs analyzed** circuit by circuit by a method which offers greatly simplified procedures and accuracy which checks with more complicated systems—*p. 467.*

—**Controlled loads test towers** under any desired conditions at plant of American Bridge Company. Designs improved, permitting structural economies and lower erection costs—*p. 470.*

Half-mill tax in Palmetto State legal

—**South Carolina law upheld.** Special federal court, sympathizing with utilities, none the less finds valid half-mill kilowatt-hour tax on energy imposed by this year's Legislature—*p. 442*

—**Three-way power imbroglio.** United States and Canada seem no nearer a treaty on St. Lawrence development, but New York State Power Authority will hold hearings just the same—*p. 442.*

—**Transformer outages studied** to determine critical points in rural-line situation. Survey shows ground conditions to be a most important element. Salted grounds improve conditions—*p. 456.*

Federal Court Holds South Carolina Tax on Energy to Be Legal

DECISION that the law imposing a tax of one-half mill upon every kilowatt-hour of electrical energy generated or sold in South Carolina is constitutional was announced on September 8 by the special three-judge United States court which heard the case at Asheville, N. C., in July. (ELECTRICAL WORLD, August 8, page 225.) An interlocutory injunction sought by three power companies to restrain the South Carolina Tax Commission from collecting the tax in question was denied and the temporary restraining order dissolved with a proviso that it be continued in force for 30 days to allow complainants to decide whether they desire to appeal.

The proceeding was brought by the Broad River Power Company, the South Carolina Power Company and the Lexington Water Power Company and was instituted soon after the passage of the act in question by the 1931 South Carolina General Assembly. The court decided against the companies on every constitutional question raised, but it observed: "We have been impressed by the counsel who point to the heavy taxes already required of them and complain that the statute here will add a grievous burden to their load."

▼

St. Lawrence Development Causes Three-Way Pulling

WHILE WASHINGTON press dispatches represent the federal government as "ready and anxious" to negotiate a treaty with Canada concerning the long-discussed St. Lawrence River waterway and power development and even say that the American engineers are now willing to accept the Canadian preferred plan of two dams instead of the single dam originally favored by the United States and still desired by the New York State engineers who have examined the proposed sites, and while, as reported below, the Canadian government also is said to desire to go ahead if only the reluctance of Quebec Province can be overcome, actual international accomplishment seems still much in the future.

Nothing daunted, however, by the stationary position of the other two sides of the tripartite governmental engine in somewhat inharmonious possession of the field, Chairman Frank P. Walsh of the New York Power Authority, determined apparently that his side of the triangle shall not stay anchored—whether or not it prove the short member of an isosceles figure—but shall drag Washington and Ottawa with it, has called a series of public hearings, of which the first will be held in New York City on October 1 and subsequent ones in Buffalo and other up-state cities.

"The main object of these hearings," Mr. Walsh says, "will be to ascertain the terms which should be embodied in the contracts for the disposition of the 5,000,000,000 kw.-hr. of electricity which New York State plans to produce through the development of the international section of the St. Lawrence River." He explains that if it be found impossible through contract with the Niagara-Hudson Power Corporation to obtain the lowest possible rates for electricity generated by the state and distributed over the company's transmission system, then it will be the duty of the Power Authority to prepare plans for state distribution lines. Among the witnesses who will be called to offer evidence on these factors are executives, engineers, and accountants of the power companies, engineering experts consulted by the Power Authority, representatives of farm organizations and domestic consumers' associations.

Mr. Walsh says that there are only two questions for the two federal governments to decide before construction is started. These are a "change in the international boundary line, which need involve only the shifting from the United States to Canada of about 300 acres of farm land, worth, according to estimates which we have obtained, not to exceed $50,000, and a determination whether or not the proposed project will in any way interfere with the interests of navigation."

▼

Quebec Seen as Obstacle to St. Lawrence Treaty

OTTAWA ADVICES say that it is altogether likely the Dominion government will soon make some move toward reopening negotiations with the United States in the matter of St. Lawrence waterway and power development. While no official statement or intimation of any kind is available at the capital, there are factors which to political observers indicate the likelihood of an agreement being reached before many months have passed. The present government is pledged to the deepening of the St. Lawrence, and that is expected to be one of the first tasks to

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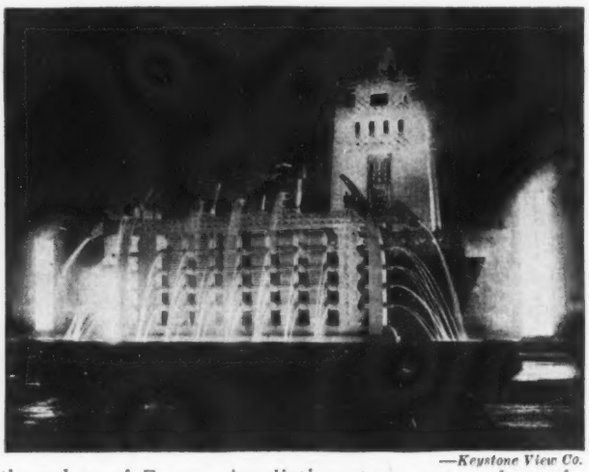
ELECTRIC BRILLIANCY CHARACTERIZES COLONIAL EXHIBITION AT PARIS



—Keystone View Co.

Forty-seven 20-ft. standards with flashing neon lamps in the colors of France, irradiating steam vapor above the posts, adorn the Allée des Colonies at the French colonial fair. Oriental-looking structures, splendid fountains and rich ornamentation abound.

which the new Canadian Minister to Washington, W. D. Herridge, will devote his attention on taking up permanent residence there about the latter part of September.

While there are admittedly international factors to be settled, the Canadian government's chief difficulty may prove to be whipping the Quebec government into line with its own views. Premier Taschereau of Quebec, whose government has just been returned to power with a very large majority, has continued to take a strong stand against the international development of the St. Lawrence upon any terms which in his opinion would involve the surrender of Canadian rights, or, more particularly, would prejudice the interests of his province, through which, for the most part, this great river runs.

None the less, Premier Bennett is reputed to be a man of much determination, and supporters of the waterway are looking to him to bring about an understanding that will pave the way to an early agreement with the United States.

▼

Utah a Coming Field for Electrochemical Industry

APPROXIMATELY 100 DELEGATES attended the sixtieth annual convention of the Electrochemical Society in Salt Lake City on September 2 to 5. The opening session on Wednesday morning was presided over by the president of the society, Bradley Stoughton, professor of metallurgy at Columbia University. Addresses of welcome were made by Governor George H. Dern and John F. Bowman, Mayor of Salt Lake City.

J. O. Elton, manager of the International Smelting Company, spoke on "Salt Lake City, a New Electrochemical Center," asserting that an ideal combination of conditions and materials exists within the state for electrochemical industries. He urged that attention be given to the development of cheap power, either from mercury boilers or steam, pointing out that the neighboring state of Nevada is a leading mercury producer and that Utah itself has great coal reserves. Technical discussions of the use of cyanides in metallurgy followed in the afternoon session.

Stabilization of silver was the subject of a round-table discussion at the Thursday morning session, at which Prof. J. A. Fulton, head of the Mackay School of Mines, Reno, Nev., presided. W. Mont Ferry of Salt Lake City, president of the American Silver Producers' Association, made the chief address.

At a special session on Thursday evening Dr. Edward F. Northrup, inventor and developer of the coreless induction furnace, received from Dr. Stoughton the Edward Goodrich Acheson medal for outstanding achievements in the field of electrochemistry. The award consists of a gold medal, a replica medal in bronze and $1,000 in cash. Dr. Northrup gave an address tracing the development of electricity through various phases of scientific research and experimentation.

On Friday the delegates were taken on a tour of the Utah Copper Company's properties, including the mine at Bingham and the mills and smelters at Magna, Arthur and Garfield. Saturday was devoted to a symposium on the physical chemistry of flotation, conducted by Professor A. M. Gaulin of the Montana School of Mines. This meeting was held at the University of Utah.

▼

Harry P. Davis Dies—Father of Broadcasting

AS THE ELECTRICAL WORLD closes its forms news comes of the death of Harry Phillips Davis, a vice-president and director of the Westinghouse Electric & Manufacturing Company, chairman of the National Broadcasting Company and one of the country's foremost engineers and executives. Dr. Phillips died at his home in Pittsburgh on Thursday morning, after several months' illness which followed an operation.

For 21 out of the 40 years he was connected with the Westinghouse organization he was in charge of engineering, and for 15 years he directed both engineering and manufacturing operations. Eleven years ago he established radio station KDKA, thereby becoming the father of commercial broadcasting. He was also an important factor in rail electrification.

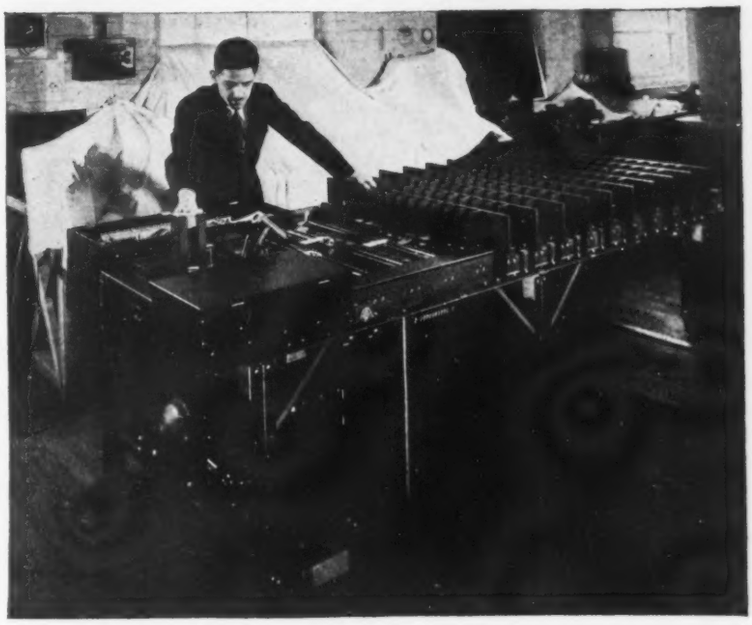
▼

Work Forms Keynote of Rocky Mountain Meeting

WORK WAS THE SPIRIT which prevailed at the three-day convention of the Rocky Mountain Division, N.E.L.A., held at Estes Park, Colo., September 2-4. Under the direction of President J. E. Loiseau an excellent program of papers and entertainment had been prepared. Merchandising and trade relations came in for full discussion. President J. F. Owens of the national body said that the merchandising squabble offers to the industry one of the greatest opportunities ever presented to remove misunderstanding of its business. There is nothing more vital than for every property to hold conferences immediately with local merchants and put into effect the principles of the joint committee.

Results of a merchandising survey presented by L. W. W. Morrow, editor of the ELECTRICAL WORLD, revealed

PHOTO-ELECTRIC TUBE TAKES CARE OF THE BILL STUBS



Operated by an "electric eye," this device—the work of D. A. Young of the Westinghouse Newark plant—can instantaneously "read" cards fed to it automatically by the thousand and direct them to the right compartment among the 100 provided. It thus eliminates tedious manual operations in large utilities and other establishments.

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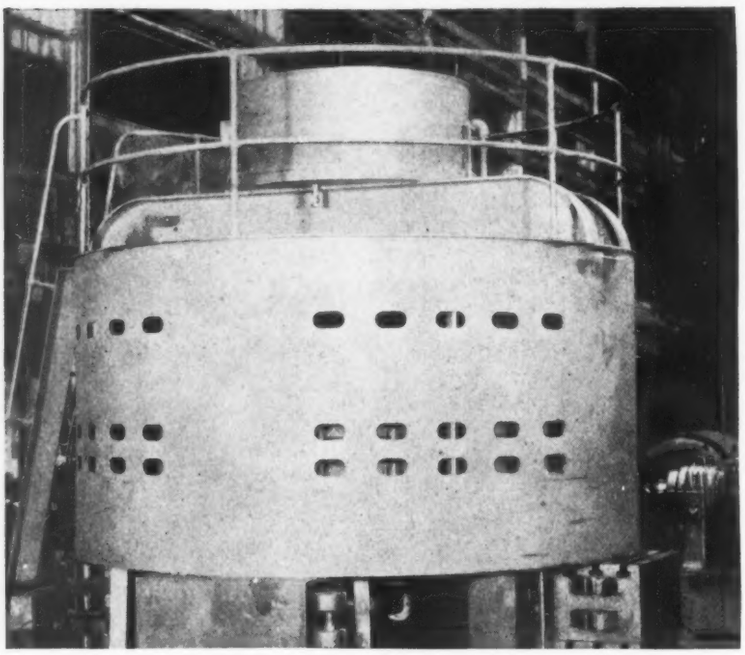
THREE-SPEED VERTICAL MOTORS BUILT FOR FORD



Four vertical synchronous motors shipped by the Westinghouse company to the River Rouge plant of the Ford Motor Company are so designed that a future unit in the form of a separate armature and rotor installed on the present frame and shaft will add to the present ratings—700 hp. at 277 r.p.m. and 350 hp. at 138 r.p.m.—a third, 300 hp. at 200 r.p.m.

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some startling facts. He said in part: "We are doing little but quarrel among ourselves and are acquiring the depression disease from surrounding businesses. We know our market, yet are doing little to develop it. It is not that we have too many retail outlets at present, but too few. Retail distribution is suffering from lack of efficiency in selling and from impediments to economic selling." He saw necessity for co-operation to do three things—first, educate and increase economic efficiency of individual business enterprises; second, survey markets and create customer demands, and third, establish distribution channels, service channels and market development channels as a part of a joint program.

E. C. Greenwood, commercial director N.E.L.A., said that there is plenty of business ahead and the buying public is more scared than impoverished. He spoke of the success of the refrigeration campaign and told of future commercial plans.

In discussing advertising and publicity Frank R. Jamison expressed the opinion that the industry ought to cease telling the public that rates will continue to come down, because it is impossible for the downward trend to continue indefinitely.

Reduction of system losses was authoritatively discussed by M. M. Koch. System losses now run around 20 per cent, he said, which means $400,000,000 loss in revenue to central stations. If these losses could be cut in half, it would mean a tremendous saving. Total system losses can be determined quite accurately by properly placed meters, and with knowledge of operating and physical conditions legitimate losses also can be determined accurately. To determine losses in the various parts of the system a kilowatt-hour balance sheet should be developed. Losses can then be divided into three general classes — transmission, conversion and distribution. Analysis of these losses is a detailed and tedious job, but no greater opportunity lies ahead of the engineer than the recovery of some of the present excessive losses.

A tax analysis to show who pays the taxes in a taxless town was presented by H. H. Sands, who found that the man least able to pay was badly discriminated against in favor of those who should bear the greater burden of taxation. Other papers and discussions included a well-received address by Merle Thorpe, editor of *Nation's Business*.

W. W. Neilsen of Santa Fe, N. M., is the newly elected president of the Rocky Mountain Division for the ensuing year. Fred Norcross and J. C. Keegan were re-elected vice-presidents, and G. B. Buck of Denver was elected to fill the vice-presidential vacancy.

Maltbie Not Worried by New York Rate Situation

WITHOUT REPLYING directly to the suggestion of Corporation Counsel Hilly of New York City, supported by the Real Estate Board of the city and other organizations of consumers, and alleged to be in line with Governor Roosevelt's personal view, that the Public Service Commission of the state should reopen the New York Edison systems' rate hearings because of the large number of complaints said to have been made by commercial customers, Chairman Maltbie of the regulatory body wrote to Mr. Hilly this week that the commission is not prepared, on the basis of only a few weeks' experience, to overhaul the entire rate structure of the four companies. A hearing on a specific complaint was, however, set for Friday.

Mr. Maltbie said that the commission has been observing closely the operation of the new rates since they went into effect in July and intends to see that consumers as a class obtain the full benefits of reductions estimated to total at least $5,500,000 a year.

The commission, Mr. Maltbie wrote, will consider all complaints regarding the new rates, but it does not expect to be able to satisfy all consumers. He disclosed that the companies had already made several modifications in rate practices as the result of complaints from commercial consumers.

▼

Western Virginia Court to Hear New River Case

JURISDICTION WILL BE TAKEN by the United States District Court in western Virginia, that court has just announced, in the litigation between the Federal Power Commission and the Appalachian Electric Power Company over the rights of the power company on the New River. Here, it will be remembered, the company demanded a minor license and the commission refused to give it anything save a standard license vesting the commission with all its statutory powers.

The power company filed a bill contending that the action of the commission constituted a cloud on the company's title and asked the court to remove this cloud. The commission moved to quash the petition and challenged the jurisdiction of the court. The case was argued on July 28. (ELECTRICAL WORLD, August 8, page 224.) The effect of the decision just handed down is to bring the power company's petition before the court on its merits. Forty days was allowed the power company in which to file briefs.

Ontario Hydro Formally Defends Its Policies

As a refutation of various charges which have been leveled against it during recent weeks, the Ontario Hydro-Electric Power Commission has issued a memorandum in defense of its policies. The contention that proper judgment is not being exercised in the provision of power supplies cannot be supported by proper evidence, according to the statement. Problems of St. Lawrence development are still unsettled, the statement continues, and it will probably be eight or ten years before Ontario's full share of power becomes available. On the Ottawa River, it says, there are large power sites which cannot be developed until certain matters involving rights are adjusted.

Discussing the question of purchased power, which for long has been a bone of contention, the memorandum points out that the Niagara system was started with 100,000 hp. purchased from a private company in 1910. The Ottawa system, the Thunder Bay system and another existing system were started with purchased power, and in other systems purchased power has been used to supplement that generated by the commission. A trained technical staff considers the question of supply and demand. Since 1918, it is pointed out, there has never been a year recorded in which an output of electrical energy 50 per cent greater than the then existing output was not required within five years.

Deliveries of purchased power are in the main deferred, it is explained. The provisions made for power, together with the output of the commission's existing power plants, will aggregate in all about 2,000,000 hp. by 1937. The commission has not up to now been able to provide even the minimum of reserve which operating organizations in general have considered it the part of wisdom to maintain.

▼

Change in Hydro License Involves Disputed Policy

Approval of an amendment to the license for the Rock Island project of the Puget Sound Power & Light Company, now under construction on the Columbia River, has been given by the Federal Power Commission. Chairman Smith explains the modification of plan as involving a relocation of the dam in its southwestern portion with consequent changes in the west spillway and the relocation of the future navigation locks from the east channel to the southwest channel, with the relocation of one fishway. The change is believed to provide a more favorable location for the locks and thus to serve better the interests of future navigation. The company assumes liability for the estimated increase in the cost of dredging shoals in the upper reaches of the pool whenever the government adopts a navigation project involving such work.

The Chief of Engineers did not approve of the requirement with regard to dredging. There is a tendency in other quarters to question the policy of adding new conditions when an amendment to a license is requested. In this case the principle probably is all that is involved, as the dredging is remote and would be comparatively inexpensive, whereas the reduction of the pool level makes possible a saving of more than $300,000. Thus far expenditures on the Rock Island project have been approximately $10,000,000.

▼

Georgia Commission Sets up Three Districts

Among the bills which failed at the recent session of the Georgia Legislature were one to abolish the Public Service Commission and another to reduce its membership from five to three.

Re-electing James T. Perry as chairman and electing Perry T. Knight as vice-chairman, the commission recently divided the state into three districts and selected Commissioner Calvin Parker to hear complaints in the Waycross section, Commissioner W. R. McDonald to hear complaints in the Augusta section and Commissioner A. J. Woodruff to hear complaints in the Atlanta section, thus saving considerable expense for traveling by reducing materially the frequency of meetings of the state body.

▼

Reports Against Scheme for San Diego City Plant

Lester S. Ready, San Francisco consulting engineer employed by the Common Council of San Diego, Calif., to determine the advisability of installing Diesel equipment to serve a downtown lighting district, strongly advised against such a move in a report submitted to the Council recently. Mr. Ready gave as his opinion that the installation of this equipment, as proposed by the Fairbanks-Morse Company, would increase the charge for street-lighting service during the first five years' operation about $30,000 annually and "that the average cost over a long period of time of street-lighting service by a city-owned Diesel-engine plant would not be less than that which the city should experience through the purchase of this same service from the San Diego Consolidated Gas & Electric Company."

The engineer gave it as his opinion that the power company "should re-

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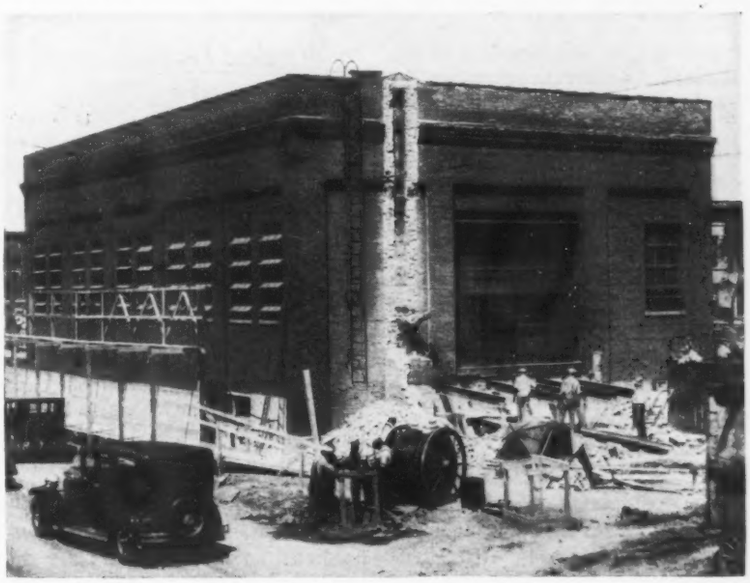
SUBSTATION BACKS FROM THE PATH OF PROGRESS



On Saturday, August 29, a substation of the Chicago Surface Lines was an obstacle to the widening of Western Avenue. In eight hours the 2,500 tons of building and equipment was jacked back 17 ft. and the substation was again operating. Both lead-covered a.c. power supply cables and trolley feeder cables were paid out from the frame as the building moved.

duce the charges for street-lighting service in the city at this time by approximately $4,000 below the charges resulting from its proposed rate, provided the specifications for street-lighting maintenance and operation are modified to comply generally with its proposal."

He also asserted that the most economical way to bring about a reduction in rates is to apply to the Railroad Commission and have them fixed and that general lighting as "supplied by the San Diego Consolidated Gas & Electric Company through use of its general overhead system . . . is so scattered that it would be entirely uneconomical for the city to serve other than the central area" if it should operate a power plant.

▼

No Progress Made Toward Oregon Utility Districts

TECHNICALITIES INVOLVED in the preparation and filing of petitions for authority to form public utility districts under a recently enacted Oregon law are rendering it well-nigh impossible to comply with the strict letter of the statute, judging by the experiences of four different districts the citizens of which have so far failed to submit petitions which will be accepted for official filing by the Hydro-Electric Commission of the state. The last petition to be denied a filing by the commission was presented by the voters of Triangle Lake (ELECTRICAL WORLD, August 29, page 358), the department's counsel who examined the articles holding that they neglected to name and describe the voting precinct, if any, located within the boundaries of the proposed utility district. Defects in other petitions filed ranged from the improper description of the boundary lines of the proposed districts to the neglect to incorporate sufficient information concerning the specific purpose of the projects contemplated in the petitions.

For the first time since its creation by the 1931 Legislature the commission will on October 5-6 hold formal hearings of water-power applications involving major hydro-electric developments. Among these applications are those of the Oregon Light, Power & Irrigation Company, covering a permit to appropriate 750 sec.-ft. of water from the Clackamas River; of O'Neill Brothers & Callaghan, involving appropriation of 650 sec.-ft. from the North Fork of the Santiam River for the development of 7,755 hp., and of Wallace Huntington, regarding his proposal to appropriate 750 sec.-ft. of water from the McKenzie River and Clear Lake for power development.

The Oregon Public Service Commissioner announces that dates will soon be set for public hearings in connection with rates charged by the California-Oregon Power Company and the Idaho Power Company, which serves territory in the far eastern section of the state.

UNWISDOM OF THE SERPENT

From more than one part of the country stories coming in show that snakes have joined birds, cats and squirrels in self-electrocution. These two crawled up the steel superstructure of the Leeds (Ala.) station and put a 110-kv. line out of duty.

▼

Senator Norris' Stand on Irrigation Plus Power

SENATOR GEORGE W. NORRIS of Nebraska has receded from his position that power development be given equal consideration with irrigation in the working out of the plan of storing Platte River waters in connection with the federal program of river flood control. The Senator says, in answer to Nebraska critics, that irrigation should be the first consideration, but that the engineers' report indicated that there would be a large amount of primary power produced, and that in any event it would be folly, after the government has gone to the expense of building dams and storage reservoirs, not to put in a wheel in order that power be produced as the reservoirs are drained. He admits that in some cases only secondary power would be produced, but says that this does not justify building for storage only.

The Senator adds that he favors a linking up for power-producing purposes of all flood-control reservoirs to be built by the federal government. By combining the different reservoirs with transmission lines, and perhaps in some instances adding auxiliary steam plants, there would, he says, be a great amount of primary power produced.

▼

Scattered Happenings in the Electrical Sphere

UNITED STATES

Middle West Towns Vote on City Plants

Le Mars, Iowa, defeated a proposal for issuing bonds to build a municipal power plant on September 3 by 922 to 912. On the same day Remsen, Iowa, voted by 456 to 130 for a similar proposal. Fairfield, Iowa, will soon hold an election to decide the same question. Lake Mills, Iowa, has awarded a contract to Fairbanks-Morse for a Diesel engine plant. In Missouri, Sullivan on September 1 voted by 523 to 86 for a city plant, which will compete with the Missouri Electric Power Company.

Banning, Calif., Keeps Its Wires

By a vote of 369 to 185, the citizens of Banning, Calif., at a recent special election voted to reject the proposal of the Southern Sierras Power Company to purchase the municipally owned distribution system, for which the power company had offered $140,000, promising a reduction of 25 per cent in rates.

Grand Island Would Oust Utility

Court action has begun at Grand Island, Neb., to oust the Central Power Company from that city, headquarters for all of its operations. The court is asked to forbid it to continue to supply electrical energy within the municipal borders or to make natural-gas connections into the city. A charge of violation of the company's franchise is based on its having carried high-tension wires through the city. The company contends that it has a perpetual franchise, while the city says such franchises are forbidden by the constitution. The Central Power Company is a subsidiary of the Middle West Utilities.

To Sell Little Rock Municipal Plant

The Little Rock (Ark.) City Council has voted to sell the municipal light and power plant to Burke Smith of that city for $10,500. The plant broke down in January of this year, and since then the city has been purchasing electricity from the Arkansas Power & Light Company for 1.25 cents per kilowatt-hour under a five-year contract. That company is not concerned in the purchase.

Opposes Enlarging Cleveland City Plant

The Cleveland Chamber of Commerce has disapproved placing on the November ballot the question of issuing $2,500,000 in municipal lighting-plant expansion bonds. It gives these reasons: The present plant is not overloaded and

there is no prospect that it will be in the immediate future; the reserve for deferred upkeep is sufficient to maintain the plant and provide financing for a moderate rate of expansion, and comparison of rates with other cities does not indicate that the plant has any effect as a rate-regulating factor.

Los Angeles City Inquiry Opens

Investigation of the Los Angeles Water and Power Department, ordered by City Council, opened September 1. Councilman James M. Hyde, the chairman, announced that the committee was merely conducting an investigation into the affairs, administration and operation of the department and that no charges had been filed. After hearing testimony from Dr. John R. Haynes, member of the Board of Water and Power Commissioners, the hearing was adjourned until September 15.

Idaho Falls Wins Temporary Injunction

An injunction suit to restrain the Commissioner of Law Enforcement of the State of Idaho from collecting the half-mill kilowatt-hour tax on power generated by the municipal plant of Idaho Falls has been filed by the city attorney of that community and a temporary injunction has been granted by the District Court. The Attorney-General of the state had previously rendered an opinion that the municipality would have to pay this tax like any other genrating agency. (ELECTRICAL WORLD, August 22, page 314.)

Seattle Buys City Light Basements

Terms of an agreement by which the city of Seattle will purchase for $189,300 the completed portion of the new City Light Building, started as a private enterprise, have been agreed upon. The City Light Building Company will place in escrow a sufficient part of this sum to reimburse purchasers of preferred stock in the building project. The city gets a sub-basement and basement, which will furnish quarters for substation equipment to serve the downtown district. It may erect two additional floors.

Kentucky-Tennessee Utility's New Unit

An increase of 55 per cent in capacity has just accrued to the Kentucky-Tennessee Light & Power Company through the addition at Bowling Green, Ky., of a 7,000-kw. steam generating station begun in February.

Another Mississippi River Crossing

The tower on the Tennessee side for the Memphis Power & Light Company's high-tension line across the Mississippi River has been completed, and the Arkansas tower is nearing completion. Stringing of the river crossing cables is beginning. This line is of standard steel-tower construction from South Memphis to Weaver Road and from Weaver Road to the river uses the wood creosoted H-frame type of structure.

Street Lighting in New York State

A revised model plan of street lighting for cities in New York State is to be considered by a committee of the State Conference by Mayors in consultation with representatives of the Empire State Gas and Electric Association and with expert advice from electric manufacturing companies.

New Commission Rule in Wisconsin

Taking advantage of a law passed this year to increase its powers, the Public Service Commission of Wisconsin has issued an order providing that electric utilities must not extend service or power lines or undertake major types of utility construction without first receiving authorization from the commission. Conditions have grown up whereby many utilities duplicate equipment and lines at considerable expense to themselves as well as to the public, the commission said.

Lower Rates in Central Missouri

The Missouri Public Service Company has filed with the state commission a new schedule of rates for 44 towns and villages in central Missouri, effective on November 1. The tariff will then be 12 cents a kilowatt-hour for the first 5 kw.-hr. in any month, a reduction of 1 cent. The towns are in Bates, Benton, Cass, Henry, Johnson, Pettis and Vernon Counties.

Eel River to Produce Power?

Incorporation of the American Utilities Development Company to build a hydro-electric plant on the Eel River about 50 miles southwest of Indianapolis is announced. There is to be a 150-ft. head, and a lake 22 miles by 9 miles will be formed, according to the promoters.

Louisville Gas & Electric Program

A new substation, to cost $250,000 and form part of a half-million-dollar extension plan, is about to be erected by the Louisville Gas & Electric Company on South Eleventh Street to increase its industrial service. Another substation will follow in Crescent Hill.

Coming Meetings

International Association of Electrical Inspectors—Eastern and Western Sections (joint meeting), Pittsburgh, Sept. 14-17. R. W. E. Moore, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Southern Section, Dallas, Sept. 21-23. R. L. Gatewood, P. O. box 1743, Atlanta. Southwestern Section, Sacramento, Calif., Sept. 28-30. C. W. Mitchell, 914 Merchants' Exchange Bldg., San Francisco. Northwestern Section, Salem, Ore., Oct. 5-7. F. D. Weber, 414 Lumbermen's Bldg., Portland, Ore.

National Electrical Manufacturers' Association—New York, Sept. 16-18. A. W. Berresford, 420 Lexington Ave., New York.

American Welding Society — Copley-Plaza Hotel, Boston, Sept. 21-25. M. M. Kelly, 33 W. 39th St., New York.

New England Division, N.E.L.A.—Poland Springs House, South Poland, Me., Sept. 28-30. Miss O. A. Bursiel, 20 Providence St., Boston.

American Association of Engineers—Huntington, W. Va., Sept. 28-30. M. E. McIver, Willoughby Tower, Chicago.

American Electric Railway Association—Atlantic City, Sept. 28-Oct. 2. Guy C. Hecker, 292 Madison Ave., New York.

Great Lakes Division, N.E.L.A.—French Lick Springs Hotel, French Lick, Ind., Oct. 1-3. T. C. Polk, 20 N. Wacker Drive, Chicago.

Association of Electragists International—Hot Springs, Ark., Oct. 5-8. L. W. Davis, 420 Lexington Ave., New York.

National Safety Congress—Chicago, Oct. 12-16. W. H. Cameron, 20 N. Wacker Drive, Chicago.

Illuminating Engineering Society—William Penn Hotel, Pittsburgh, Oct. 13-16. E. H. Hobbie, 29 W. 39th St., New York.

National Association of Railroad and Utilities Commissioners — Jefferson Hotel, Richmond, Va., Oct. 20-23. J. B. Walker, 270 Madison Ave., New York.

Wisconsin Utilities Association—Commercial Section, Oct. 22-23. Hotel Loraine, Madison. J. N. Cadby, 135 W. Wells St., Milwaukee.

American Institute of Electrical Engineers—District meeting, Kansas City, Mo., Oct. 22-24. F. L. Hutchinson, 33 W. 39th St., New York.

National Electrical Wholesalers' Association—Starrett's Netherland Plaza, Cincinnati, Nov. 9-13. E. Donald Tolles, 165 Broadway, New York.

North Central Electric Association—Accounting Section, St. Paul Hotel, St. Paul, Nov. 13 and 14. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

CANADA

Nova Scotia May Develop More Hydro

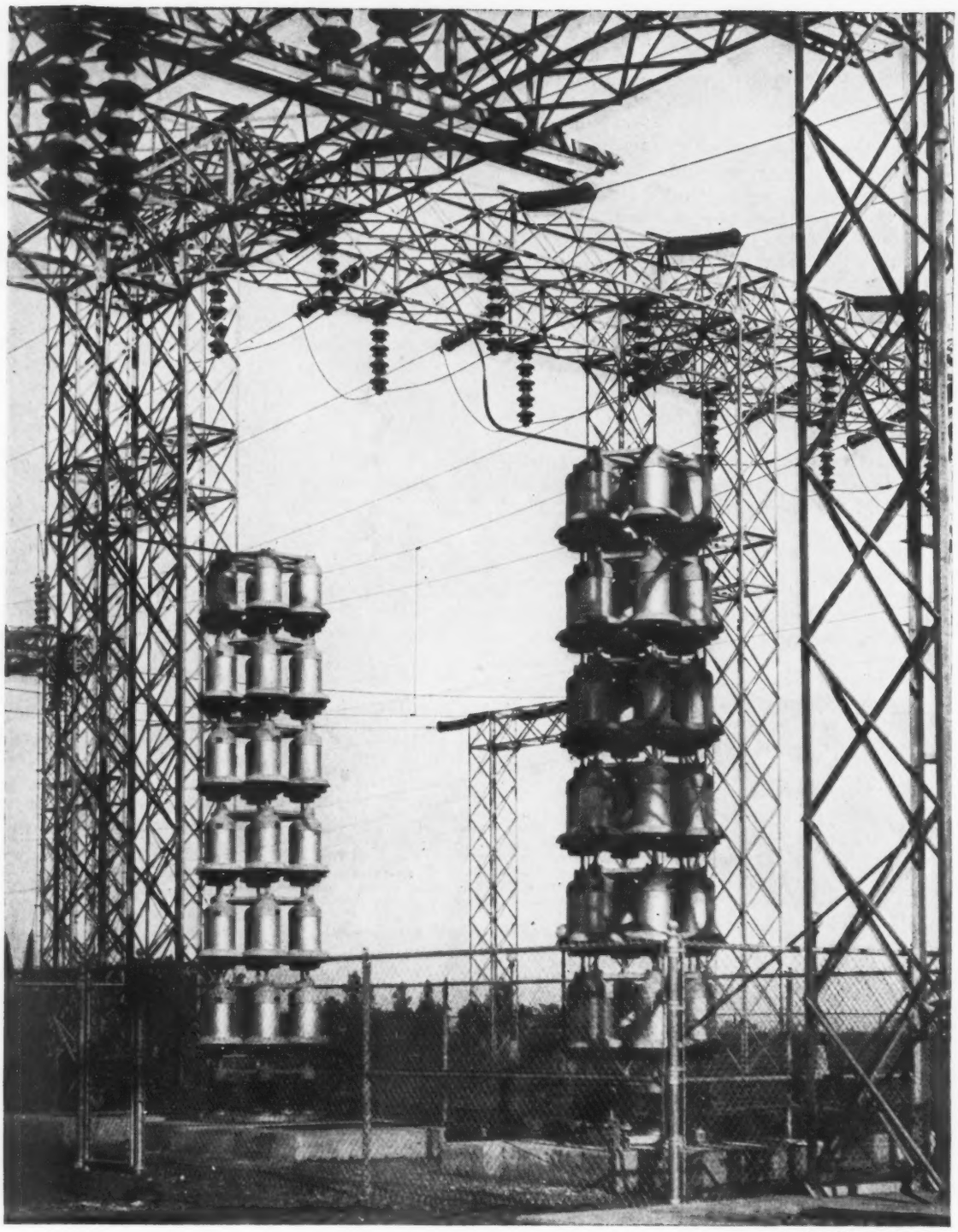
Provided that a market for the output is assured, the Nova Scotia government is prepared to go ahead with the development of the Lake Ainslie hydro-electric project at an approximate cost of $1,750,000. The market would lie in Cape Breton, and it is reported that the government is prepared to supply energy from Lake Ainslie at the figure quoted by the Dominion Steel & Coal Corporation for energy transmitted from its Seaboard plant.

New Rates for Victoria, B. C.

The British Columbia Electric Railway Company announces that on October 1 a new basis of charges will go into effect in its Greater Victoria area. The floor-area rate will be adopted, and after 3 kw.-hr. per 100 sq.ft. has been consumed at 6 cents all additional energy will be billed at 3 cents. Separate meters for electric ranges will be eliminated. The monthly minimum charge for lighting is 75 cents, or $2.25 with electric range. The minimum floor area is 1,000 sq.ft.

French Electrical Engineers in Canada

A party of twelve French electrical engineers headed by Charles Malegarie, president of the Compagnie Parisienne de Distribution d'Electricité, arrived at Montreal last week to make a tour of Canada to study electrical plants and problems from an economical and technical point of view.



Courtesy Ohio Brass Company

220-kv. coupling condensers for carrier telephone

This coupling arrangement is used for interstation communication on the Pacific Gas & Electric system. A tap-off may be used on these condenser stacks for relay operation, voltage indication or for synchronizing

EDITORIALS

L.W.W.MORROW
Editor

Federal regulation not the way out

THESE are days of dissatisfaction. While all manner of criticism is directed against utilities, utility men and utility policies, regulatory state commissions, too, have come in for their share of calumny. Regulation has broken down, say some critical commentators upon the times. Commissions, of their very nature, cannot undertake the tremendous task for which they were established, say others. State regulation is best, say utility men. Federal regulation is hinted at from time to time.

For the purposes of the argument, let us assume that local regulation has fallen down or even fallen down badly—but would federal regulation be any better? Any breakdown in the local regulation has been due as much to deficiencies in the ability, or possibly in a few instances in the character, of the commissioners involved as to faulty policies pursued by utility companies. The regulatory task not infrequently proves to be too big for one man or a small group of men to handle. Would it be any better under federal regulation? It is almost inconceivable that any one man or small group of men could so grasp the problems confronting the electric utility companies as to offer that degree of omniscience necessary to make a success of the complete supervision of all the affairs of all the utilities of this nation. It is no exaggeration to state that the supervision of the activities of single utility ownership units has grown to be a tremendous task for management and almost too great a burden for one man as it is.

Rather than regional federal regulation, it would seem desirable that the people and the electric utilities of these United States place their faith and confidence in the increasing ability, integrity and intelligence of the personnel of state commissions; that they aid in the tightening of regulatory machinery and authority where necessary, and that they see to it both that sufficient rewards shall be paid to commissioners to secure men of high caliber and ability and that they shall be furnished with sufficiently large staffs to follow up properly on the routine detail work. Assuredly this would be the better way. Regulation, like management, should be close and intimate in its contacts with the problems of public service.

How many inoperative devices are reducing revenue?

DURING a single survey of the condition of its customers' domestic appliances one company found that 240,000 had to be adjusted or repaired to be put in serviceable condition, according to H. T. East, chairman of the N.E.L.A. customers' relations committee. On another system it was found that 80 per cent of the 14,000 appliance repairs made involved the cord.

While these figures may not be typical, they at least suggest the advisability of more companies adopting periodic surveys of this type and warning customers against the purchase of apparatus with flimsy connecting cords or against abuse of the contrivance. With a large percentage of equipment inoperative, the utilities do not receive the energy revenue they should from existing appliances and the customers are deprived of the convenience these might afford and of the maximum use of their investments.

Inoperative devices are often laid aside without repair because customers are not easily able to find some one to repair the device promptly and at moderate cost, or because of the inconvenience of carrying the device to and from the repair

shop. Hence a traveling repair man who can make minor repairs on the spot or receive and return appliances requiring major repairs is a welcome visitor to the customer and a revenue producer for his company, especially if this work is combined with some other duty.

If a traveling repairman is not employed, it will pay a utility to keep customers always aware that the company is ready to give advice or assistance in the maintenance of their electrical apparatus and also to check up periodically to see that inoperative devices are not accumulating on shelves. To discover and repair unused appliances now might offset the reduced increment of new loads.

Rate forms can be simplified

ON STUDYING the charges for electric service in various localities, or even the charges for different kinds of service in a given locality, one cannot help noting the great variation in manners of expressing the rates. This variation is to be expected, for the rates have been fixed at different times by different individuals and have been changed from time to time as expedience dictated. Changes have been made in individual rates rather than in rate structures, and the result has been a nation-wide and frequently a local inconsistency in the manners of charging for electric service, if not in the charges themselves. This condition inspires criticism of the industry both from the customer who moves from one city to another and finds a new rate form and from those whose political animations urge them to seize upon any excuse for corrosive remarks. There is really no good reason for such a condition to endure, whatever may be the excuse for its existence. The excuses belong in the past.

A rate structure to be generally satisfactory must result in charges which are reasonably equitable as between classes of customers and between customers and yet be profitable to the company supplying the service. The application of any rate should be simple and require the use of no accessories or laborious calculations, the necessity for which cannot be readily explained to the customer. Such a structure can seldom be obtained by patching up an existing one. It must be built on a new framework, designed from a study of the electric power system as it exists at present rather than from a study of its development in years past. There are now available sufficient data on the available forms of rates for electric service to build a uniform and rational rate structure applicable over the whole country. This is not a task to be left for posterity. It should be done in our day.

Promising action on the wiring problem

ALL four branches of the electrical industry have been talking for a long while about wiring. Wiring means to electric service what good roads mean to the motor car. The lack of adequate wiring has long been a costly barrier to the use of better lighting and more appliances in millions of homes. It has been an impediment to progress in the electrification of factories, stores and offices. The question has been what to do about it, and the answer to that question has been embarrassed by two conditions. Lack of understanding between the contractors and the power companies has kept each side from appreciating the other's sincere interest in wiring progress and has interfered with the development of a co-operative purpose and program. Moreover, too many men have felt that because in the large it is a national problem nothing much could be done in their own home towns—where, after all, the whole job ultimately must be done.

The Association of Electragists is now at work on the development of a comprehensive set of standard specifications intended to guide and stimulate a better practice in wiring and encourage more adequate installations. This naturally and properly springs from the contractor as the practical man who has provided the wiring now in existence. Action is now under way to form a joint committee representing the National Electric Light Association, the National Electrical Manufacturers' Association, the National Electrical Wholesalers' Association, the Association of Electragists, the Illuminating Engineering Society, the Artistic Lighting Equipment Association and the Society for Electrical Development to develop and perfect an industry wiring standard. The matter is still in the proposal stage. But the

purpose is appealing, for it aims to define clearly what constitutes good wiring and adequate wiring. It should make it possible at last to explain how a building should be wired and why, in terms that will mean something to the public. This is the most promising move that has been made in the long and controversial history of the wiring problem.

It is fortunate that the Electragists' new specifications are so far along. It will give something concrete for the joint committee to organize around and save much time and many words. Out of a co-operative study of these specifications should emerge a well-balanced standard for wiring that will bring sound progress.

Two manholes cheaper than one?

PARADOXICAL as it may seem, it has nevertheless been demonstrated in one territory that two manholes are cheaper than one manhole at a busy intersection. By virtue of similar reasoning several individual distribution junction boxes placed in front of each customer entrance may be proved more economical than a single box taking care of five or six services. Water and gas utilities have never set out to conserve tees by clustering services about a group branch-off. Why should electric service extend the substation concept to the very extremity of its indefinitely ramified system?

Reverting to the manhole at busy traffic points, many factors conspire to give two separate manholes, close to the curb and a bit removed from the corner along the intersecting streets, a chance to compete in economy with a single manhole in the path of heavy traffic flow. Such a manhole must be square or octagonal and of large width relative to two that are half as wide and not much longer. The decking in the latter case may not need to be so heavy. The excavation and chimney may cost less because avoidance of subsurface facilities of other utilities may permit a shallower hole and also permit more economical co-ordination of roof, decking and pavement. The greater cost of impeded operations and the cost of providing safety protection all throw the balance in favor of two manholes straddling the corner.

While no pecuniary value can be attached to the goodwill that accrues from removing subsurface operations from the path of impatient traffic, this item can hardly be ignored in evaluating the relative virtues of alternative locations in congested areas. Fortunately, it is not necessary to place it in the scales in order to demonstrate that two manholes can be cheaper than one.

Reducing time element solves many difficulties

FRANK HAWKS, our most famous present-day exponent of speed, in his recently issued autobiography, says that speed is the basic asset which will inevitably launch a thousand airships across the face of the earth. In other words, he looks for speed to be the salvation of the aviation industry.

The speed idea has been applied with equal success in the solving of many difficulties that have been besetting the electrical power industry. It ought to be used still more. Many years ago flashover difficulties in the operation of rotaries were eliminated by the high-speed direct-current breaker. Only recently stability difficulties encountered, for example, in the operation of many transmission systems have been all but completely eliminated by the high-speed oil circuit breaker. The oil circuit breaker itself, which two or three years ago was considered by many competent engineers as having only a limited life and as being definitely slated for the discard, has been entirely rejuvenated by the many developments that have been made to speed up its starting time and decrease its arcing time.

Recent experiments in heat transmission between gases and water tubes at speeds heretofore never even considered, and approaching the velocity of sound, promise to alter radically all present conceptions of space and cost economies in steam generating plants. The development of the thyratron is another manifestation of the same phenomenon, for fundamentally the thyratron does electrically, and therefore quickly, what more clumsy and cumbersome mechanical devices have heretofore done mechanically. It will perform many functions eventually that no mechanical devices could perform because of their inertia.

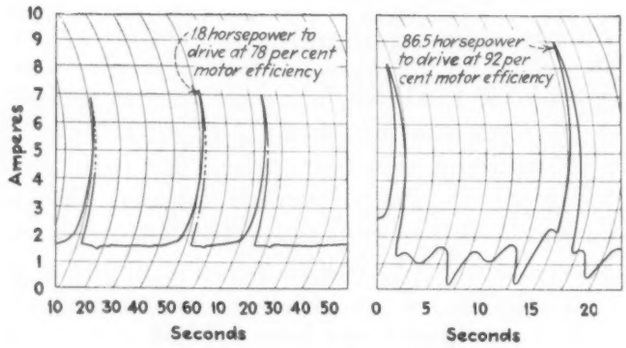
Ford Substitutes A.C. Motors for 27,000 D.C. Units*

Methods of changing to alternating from direct current drives.

Benefits include conspicuous reduction of maintenance costs and large decrease of energy lost in plant distribution.

Studies of drive duties reveal opportunities for scaling down motor sizes.

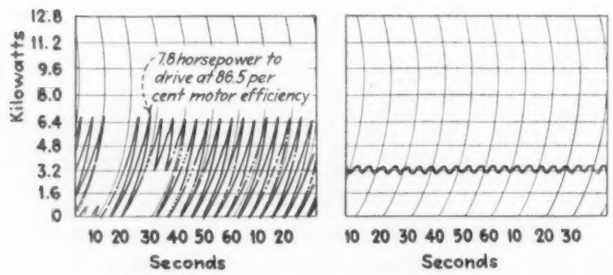
ALTERNATING-CURRENT motors are now replacing 27,000 direct-current drives in the River Rouge plant of the Ford Motor Company at Dearborn, Mich. Drives of production machines ranging in size from one-quarter to 1,750 hp., totaling 85,000 connected horsepower, are affected. Benefits from the change include conspicuous reductions in costs of motor and control maintenance, ease of expanding production facilities as they occur in future, greater safety to workmen, reduction of energy losses in distribution lines and in conversions to direct current, reduction of substation operation labor and the elimination of much connected capacity represented by overmotoring certain drives. The power and construction department of the company has been at work on this job for about a year and now has it about one-half completed. At least another year will be needed to finish it. Some direct-current drives will remain, for instance those on rolls in the steel mill and in some few other applications where


Amperes
18 horsepower to drive at 78 per cent motor efficiency
86.5 horsepower to drive at 92 per cent motor efficiency
Seconds
Seconds

Tests show overmotoring

The drive on the left-hand chart is a press in the frame assembly department, formerly a 3½-hp., 850-r.p.m. d.c. motor. It indicates that the drive is overmotored and the test showed, as may be calculated from the peak-load value in horsepower, that the motor voltage is low. The new drive is a 2-hp., 900-r.p.m. a.c. motor which nicely tops the peak loads and might even carry 100 per cent higher peaks on the indicated time spacing; 2 hp. was selected on account of heavy starting conditions.

The right-hand chart shows a 100-hp., 1,100-r.p.m. d.c. drive on a Bliss press forming rear axle hubs which was replaced by a 40-hp., 1,200-r.p.m. high-slip a.c. motor. Although the peaks are double the a.c. motor rating the high-slip characteristic and heavy flywheel raises the pull-out torque value high enough so that the motor carries on without stalling and the mean level of the load is well within the motor's thermal capacity.



High-slip motor smoothes energy peaks

These records show a Bliss press in the steel mill, powered by different a.c. motors. In one case (left) a standard 20-hp., 860-r.p.m. motor demands an excessively variable energy input, swinging from zero to 7.8 hp. In the other (right) a high-slip motor of 7½ hp., 785 r.p.m. holds the input to only about ½ hp. variations on the mean energy input of 3.3 hp. Apparently both of these drives indicate overmotoring, but this is not true in the second case since all of the unused capacity may be called upon by a change in the work of the press. These two records are a striking exhibition of the value of studying motor performances with instruments as they disclose opportunities for important reductions in connected motor loads.

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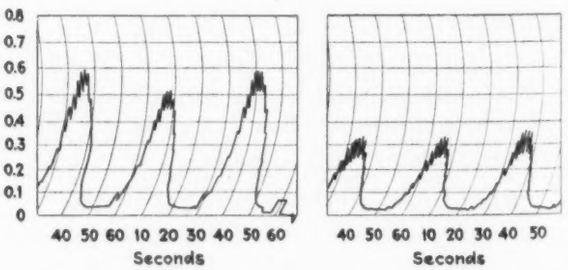


Sharp tools reduce energy demands

High overloads running up to 23.9-hp. peaks were imposed on the 10-hp. motor driving a radius milling machine making rough cuts until the recording wattmeter revealed that the peaks could be cut practically in half, reduced to 12.7 hp. by closer attention to the sharpness of the cutting tool.

direct current is clearly indicated by modern ideas of control and performance.

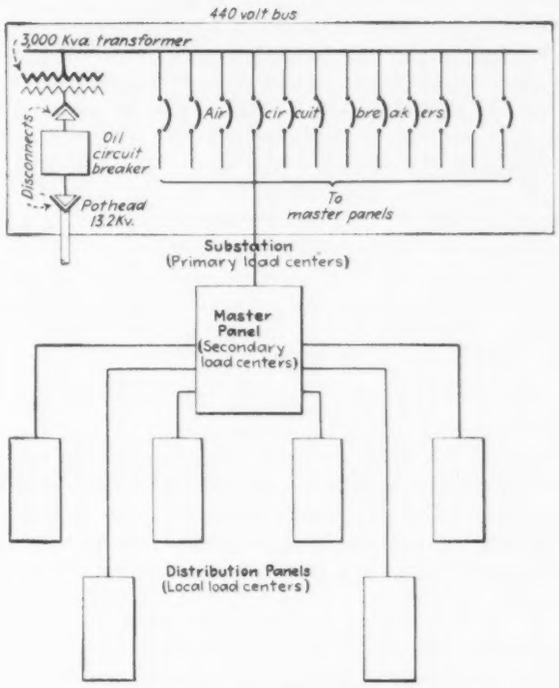
The job of changing 27,000 motors required careful and painstaking preparation. First, a general study was made of existing conditions, including sizes and duties of motors in use, from which was built up a series of "service schedules," one for each building. Each schedule, like the one reproduced in this article, lists substation supply areas, transformer capacities, connected horsepower provided for, direct current connected load before the change, replacement alternating current connected load and margin for future connection. Allowable connected load was determined from transformer capacity by the formula:

$$\text{Allowable connected Hp.} = \text{Transformer Kva.} \times \text{P.F.}\ (=0.7) \times \frac{1}{\text{Kw./Hp.}\ (=0.85)} \times \frac{1}{DF\ (=0.6)}$$

in which the specific values of power factor and diversity factor were derived by tests of motors in operation. These motor tests, which will be discussed later, indicated that a reduction of 30 per cent in connected load was possible through the elimination of wrongly applied motor sizes.

The supply areas were based on using a bank of three 1,000-kva. transformers in each substation, stepping direct from 13.2 kv. to 440 volts with delta connections, primary and secondary. Some of the substations do now, or will later, contain two of the standard banks and others are of less than the standard capacity. The smaller banks will probably be increased to the standard in the future. There are at present installed fifteen 13,200/400-volt substations totaling 53,250 kw. Nine more totaling 36,000 kw. will be added to provide the alternating current capacity needed for the changeover and to supply capacity for future use. The direct current capacity before the change amounted to 82,000 kw. in converters in seven substations. Since the d.c. voltage is 250 and the substations, few in number, are more widely separated than in the new a.c. distribution, which uses 440 volts, it is apparent that the latter will materially reduce energy losses in conductors. Of the d.c. capacity probably about 12,000 kw. will remain to serve the drives earlier referred to. At the present stage of the changeover it is not possible to state definitely that the substitution of a.c. for d.c. will reduce the installed capacity necessary. But in the end this will undoubtedly be the case and in a ratio comparable to the 30 per cent reduction in connected motor load already noted.

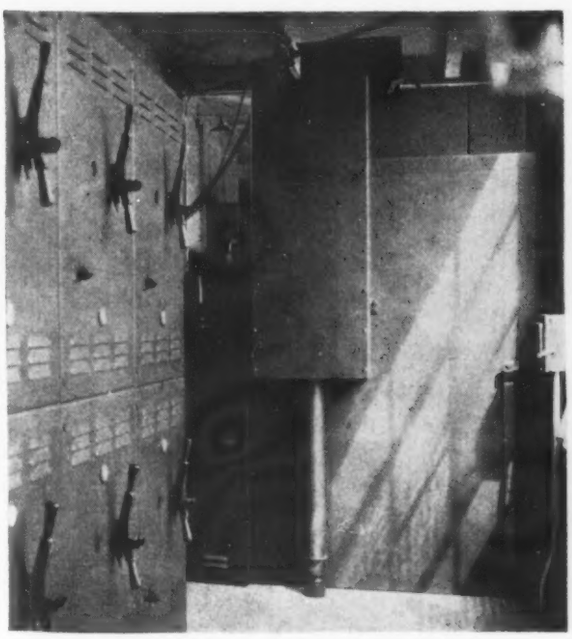
Having fixed the locations and capacities of the a.c.

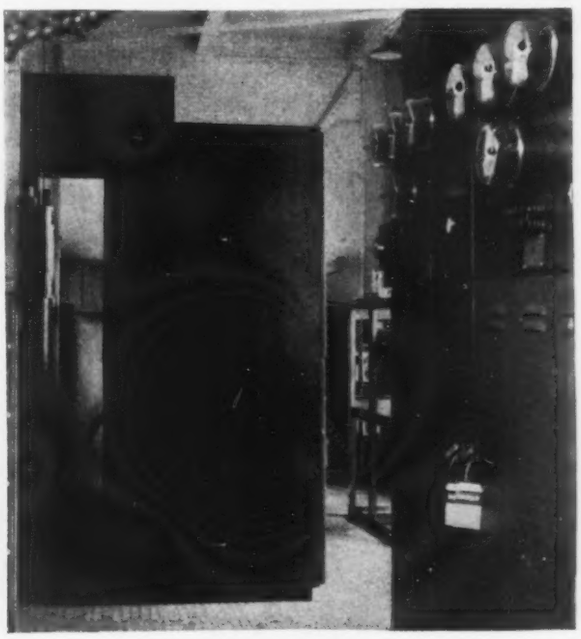


The local distribution scheme

Substations are safe

Utilization of metal-clad switchgear protects life, property and service. In the one at the left appears a group of 440-volt air circuit breakers with the end of the 13.2-kv. structure, including a feeder riser, in the background. The right-hand picture shows the front of the 13.2-kv. structure and the end of the 440-volt board and above it the protected 440-volt bus incoming from the transformer room.





substations, there followed some revision of and addition to the existing 13.2-kv. radial feeder underground system on account of the increased number of substations. The plan of distribution from the substations was set up to include direct leads to master panels, from which branches were run to the motor circuit distribution panels as shown in the sketch. The layout is such that the longest run from any substation to any motor is not more than 500 ft. and the conductor sizes were calculated for a maximum voltage regulation of 5 per cent at the motor. All of the panels are of the dead-front type, and this, with the fact that all motors are totally inclosed, eliminates open conductors or exposed live parts anywhere on the system.

A.c. distribution is entirely new construction

No attempt is made to assimilate any part of the d.c. distribution in the a.c. system. The latter is an entirely new installation right up to the motor. There are two reasons for this. The more important one is that machines in production cannot be shut down for the time that is required to pull out the existing two conductors from the conduit, rearrange the conduit between panel and motor-starting equipment and then pull in three conductors, even if in all cases the conduit were large enough for the three wires. The second reason is that added labor that would be required to handle the job in this way would more than cancel the economy represented by utilizing the old distribution facilities. The job of changing the motor on any machine amounts to a simple motor substitution plus, in some cases, a revision of belt pulleys or of gear ratios in the machine when a significant difference in speed between the old and new motors makes this necessary.

Above 100 hp. synchronous motors are used on all drives to which they can be adapted—compressors, blowers, pumps and even on some large production machines whose loads are uniform over considerable periods. The field controls of the synchronous motors are set at definite points to give the maximum average power-factor correction during normal operation of the whole plant and are not subject to adjustment by machine operators or any others than electrical department men. Squirrel-cage motors are used on all drives below 100 hp. and on many above, except in a very few cases, where the slip-ring type is absolutely necessary. The object is to minimize the number of motor designs in use. Even on multiple-speed drives squirrel-cage motors with double stator windings are used in preference to the wound-rotor type. On long conveyors, where uniformity of drive speeds is necessary, high-slip squirrel-cage motors are used. The slip range of these motors permits each one automatically to adapt its speed to the mean speed level of the group. One conveyor section, a mile in length, is driven by seven 3-hp., 1,200-r.p.m., 10 per cent slip motors and is working perfectly satisfactorily. The length of this conveyor when completed will be 3 miles.

Push buttons operating magnetic contactors constitute the standard control. The buttons are located at each machine or at strategic points along conveyor or handling systems. No compensators or other current-limiting starting devices are used, all motors being thrown directly across the line.

One troublesome thing in the change which, although it affected only about 5 per cent of the drives, caused difficulty greatly out of relation to that small proportion

Type of Service Schedule Established for Each Building

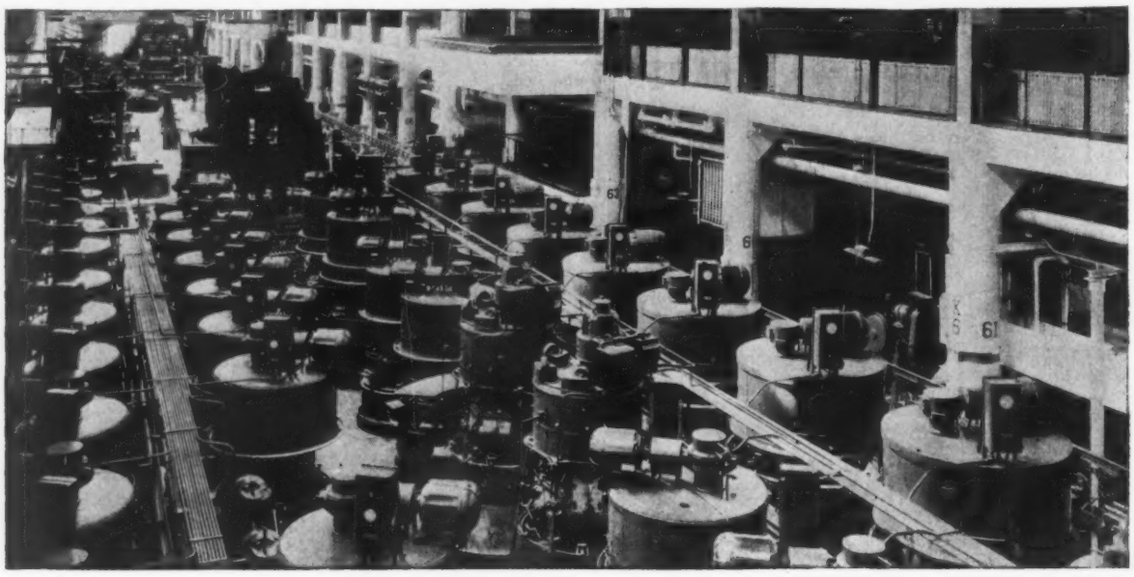
Building B—In this building is concentrated much of the parts manufacture, which, as may be noted from the provisions for additional electrical capacity shown in the table, can be greatly expanded. This schedule, quite typical of all the plant buildings, indicates how the change to a.c. drives, is made an opportunity to provide for future growth.

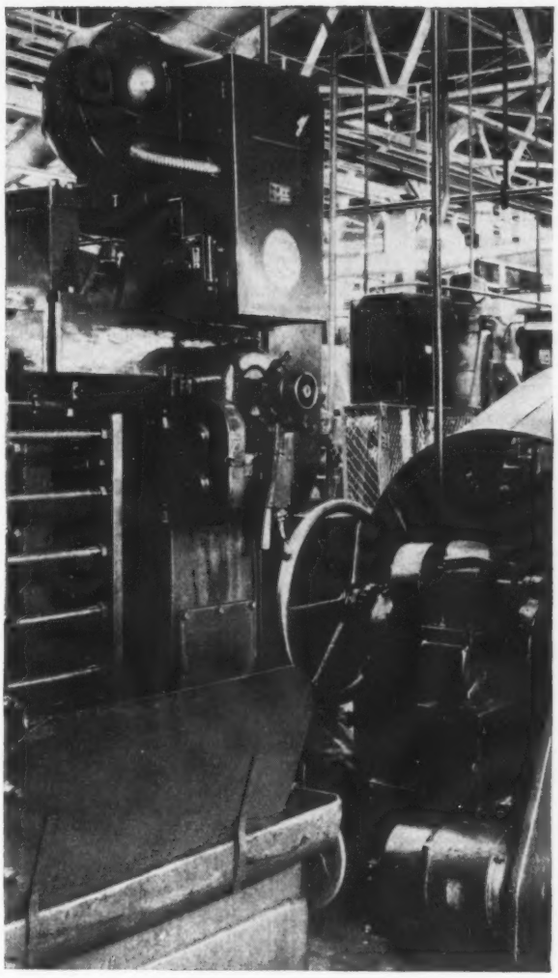
Substation Area of Service	Transformer Rating, Kva.	Connected Hp. Provided For	Present Connected Hp.* D.c.	A.c.	Additional A.c. Connected Hp. Provided For
I	3,000	4,120	3,740	2,620	1,500
II	3,000	4,120	3,555	2,490	1,630
III	3,000	4,120	4,700	3,290	830
IV	3,000	4,120	4,700	3,290	830
V	3,000	4,120	4,025	2,820	1,300
VI	3,000	4,120	4,280	2,995	1,125
VII	3,000	4,120	4,360	3,050	1,070

* Includes only productive equipment.

The change in progress

Four lines of vertical automatic multiple lathes, most of which have been changed to a.c. drive. Some that have not yet been changed appear in the center foreground of the picture. Between pairs or rows appear the circuit conduits ganged together from the distribution panels which are located at intervals along the sides of the aisle.





The old and the new

At the left is a type of automatic screw machine on which the a.c. drive has been installed. Below is a d.c. drive on a tumbler barrel not yet replaced.

is the practice of some machine-tool manufacturers to use other than standard frames on the motors applied to their products. These manufacturers appear to have the idea that the only way to mount a motor on a machine tool is by means of a special end bell built, or fitted, into the machine frame. In these cases it was necessary to fit brackets on the machines so that a standard-base motor could be installed.

Tests of motors on drives in productive operation preceded the specifications of the a.c. motor replacements. These tests were made on machines that could be taken as typical of their class, design and capacity. For instance, it was not necessary to make tests on each one of a bank of a dozen identical screw machines all doing the same work. But even with this identity factor reducing the size of the job, the number of tests made, in process and to be made runs well into the thousands. Each test consists of a five-minute record of motor performance under normal production operation at chart speeds of 3 to 12 in. per minute. These speeds are sufficiently fast to show distinction between load variations in recurrent operations in usual machine-tool production. Only two crews of two men each were employed on the testing job. By giving them a fair start before the changeover began they were enabled to keep well ahead of the replacement work.

The changeover has already resulted in a 78 per cent reduction of motor repair labor. The motor repair department, where formerly 550 men were employed, now has only 120. This large decrease is accounted for by the fact that the first motors changed were those that had been most difficult to keep in service. In such locations as the foundry, where it is impossible to keep any open-frame motor clean for any length of time, it was a normal experience to lose at least one motor per week per department and in some cases one motor per day. These locations were sought out and the motors in them were among the first to be changed. Naturally there followed a striking reduction in the labor of keeping these drives in service.

Reduction of overmotoring is estimated to have saved about 30 per cent in connected load. By study of the test charts obtained on the d.c. drives it is possible to apply quite closely the three requirements determining a.c. motor sizes. These factors are the power demand for starting the machine to overcome inertia of parts or cold friction, the pull-out torque due to peak loads and the permissible temperature rise due to continuous or intermittent load conditions.

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Stocking Supplies Material for a Conduit Fishing Yarn

By H. G. BERKEY

Missouri Public Service Commission, Jefferson City, Mo.

Most underground construction jobs have compressed air available and a cord can be blown through new conduits, but in ducts of 2-in. diameter or larger the ball of rags or cork on the end of the cord tends to lag and the cord continues to blow in and pile up. Two years ago a contractor in the city where I was working laid about 30,000 ft. of 3-in. fiber conduit with manholes spaced 300 ft. or more. His contract called for the conduits to be swabbed and a mandrel passed through them.

After watching the crew rod a few lines, he asked me if I could tell him of a quicker way to get a line through the runs of conduit. I drew him a sketch of the usual wooden plug with a half-inch pipe in the center for air and a quarter-inch hole in the side for a string and told him to put a 2½-in. cork on the string and blow it through, using his portable paving-cutter air compressor. He could not find a cork large enough, so he wrapped a 3-in. rubber ball in an old stocking and tied the cord to the stocking. The ball would go the 300 ft. in ten seconds flat.

Since then I find that a hollow ball sewed into a thin cloth is ideal for getting a string through conduit of any length. The nearer the ball is to the size of the conduit, the better it works, as the ball, if it is stopped by an obstruction, will not let air pass to pull the cord into the conduit. When it stops, air pressure immediately builds up behind the ball and will force it beyond any small obstruction. Should the ball stop at any obstruction it is easily blown out the way it entered.

Transformer Outage Determined by Ground Conditions

By R. PHILIP HART
Vice-President Cazenovia Electric Company, Cazenovia, N. Y.

STUDIES in New York State indicate that small transformers recently installed in rural areas are contributing the major share of interruptions due to lightning or distribution systems. They are in areas where artificial grounds of adequate protective value are necessitated by the relative greater exposure to lightning strokes. The reports submitted to the committee on lightning protection of the Empire State Gas and Electric Association in 1930 demonstrated in a most convincing manner that modern lightning protection will function effectively and eliminate many transformer failures. In all, 226 transformer failures were reported on 20,600 transformers of seven companies. Only ten failures (eight fuse blowing, two burnouts) were reported on transformers protected by "first-class" protection and three failures (one fuse blowing, two burnouts) on "second-class" protection. The remaining 213 failures ocurred where protection was inadequate.

In gathering the data for the 1930 lightning season it was desired to determine the relative amounts of trouble experienced on transformers in relation to size, age, degree of protection and location (rural, village or city). It was also realized that lightning arresters can protect on the primary side only and that there are cases of failure in which the surge enters the transformer on the secondary side, causing either burnout or fuse blowing. It was hoped that a careful examination of the failing transformers would reveal arc scars which would definitely determine this point, but among the seven operating companies submitting data these careful checks were found impracticable. Following is a summary of the data reported for the 1930 season:

Number of companies reporting	7
Total number of transformers owned	20,627
Cases of trouble reported:	
Fuse blowing	134
Burnouts	76
Line down, dead ends damaged and miscellaneous	16
Total	226

Fig. 1—Small new transformers most affected

Rural extensions involve the newest and smallest transformers and the greatest exposure to lightning. Blown fuses and burnouts appear in consistent proportions.

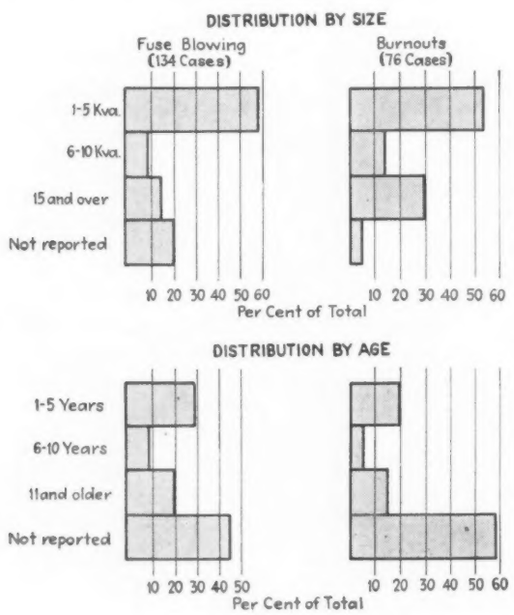
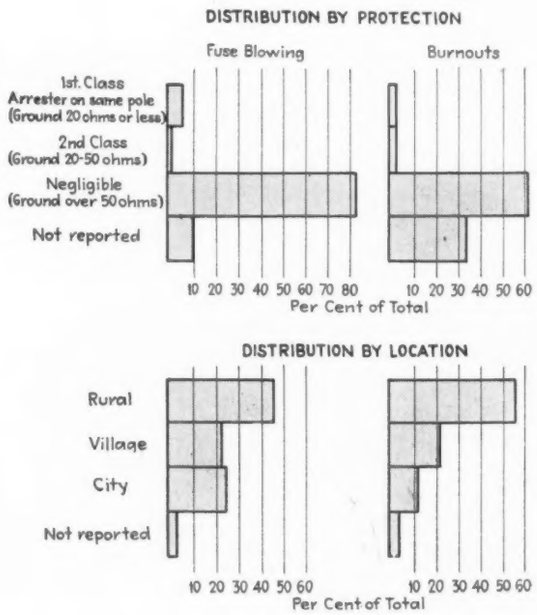


Fig. 2—Poor grounding the cause of most failures

Also the rural districts are most vulnerable. The reason is exposure and absence of ready grounds.



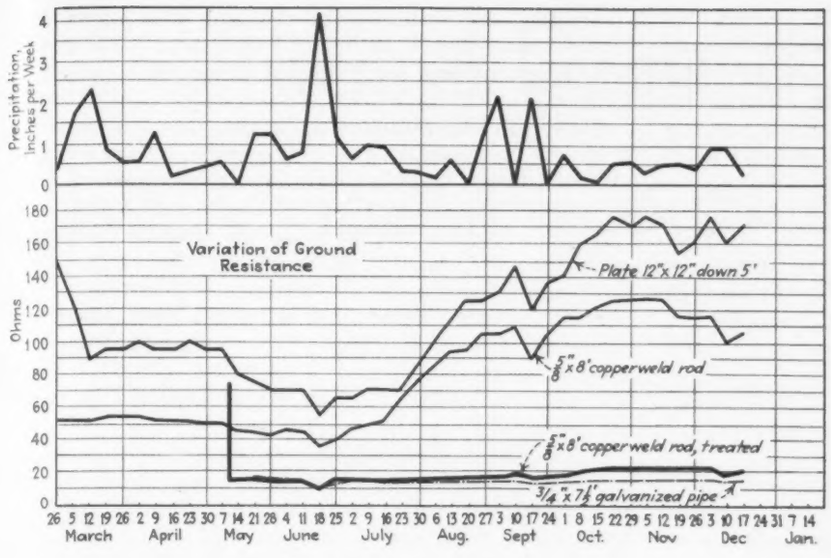


Fig. 3—Salted grounds independent of rainfall

Untreated grounds follow rainfall in their conductivity performance.

Average cost of repairing a blown fuse was $5.20. This item varied from $25 to $2.30 in the four companies giving this data. Average cost of repairing a burnout was $69.95. This item varied from $85.31 to $46.75 in the four companies giving this data. Average costs were taken from individual company reports and presumably include only labor, material and truck use.

The average outage due to lightning failure was 53 customer hours for a blown fuse. This figure varied from 7.5 to 92.4 for the six companies reporting. The average outage due to burnout was 86 customer-hours and varied from 11.5 to 110.5 for the seven companies reporting.

The distribution of failures by size and age is shown in Fig. 1, 100 per cent being the total number of cases in either type of failure. The large per cent of failures indicated for new transformers would seem to be at variance with former investigations of this subject, but on referring to Fig. 2 it will be realized that the great majority of failures are in rural locations, where the exposure is much greater, and that rural lines are comparatively new for all the companies reporting.

Particular attention is invited to the first part of Fig. 2, which indicates that the failures occurring on first and second class protection appear almost insignificant. It was felt by the committee, in view of manufacturers' recommendations, that a ground of 20 ohms or less should be obtained if possible. However, the very small number of failures occurring on second-class protection (grounds up to 50 ohms) may lead to the approval of grounds of higher values than 20 ohms.

The protection of rural distribution circuits is brought out as being a real problem. Exposure is much greater, there being little shielding by buildings and trees, and many lines being located on ridges and high points; also, more difficulty is usually experienced in obtaining good grounds. Added to these difficulties is the necessity of traveling long distances to repair a failure.

In studying the problem of proper protection, with particular reference to the rural problem, a detailed check was made of a number of grounds and a study of the variation of test ground resistances over eight months, both with treatment and without.

It is clearly brought out in Fig. 3 that the seasonal variation of a treated ground is much less than that of an untreated one. This fact has been noted by a number of investigators in the past, who ascribe it to the hydroscopic action of the salt.

It should be here noted that the treatment of both the electrodes shown in Fig. 3 and those noted later was 50 lb. of agricultural salt placed in a hole, about the size and shape of a bushel basket, around the head of the electrode. In all cases the salt was completely dissolved with water and the hole refilled.

In an endeavor to improve several grounds in the vicinity of Cazenovia eighteen were selected and measured, with the results indicated in Fig. 4. It is only fair to say that in several cases additional rods were added to bring about the desired result. The measurements made September 5, after a very dry summer, indicate a still further decrease in resistance. This is evidently due to the fact that the majority of the grounds were in hard, dense soil which had not responded fully to the treatment until some time after the second set of readings was taken. In fact, the second set was made 30 to 60 minutes after the salt had been dissolved.

A type of ground was found which proved to be particularly suited to rural work. It is placed 3 ft. from the pole so that the area around the rod for the passage of current will not be diminished by the pole itself. Galvanized iron pipe is indicated in Fig. 5 with a self-swaging cap and soldered joint to ground wire. The test loop left below the ground line furnishes slack for splicing with a screw connector after the wire has been cut for testing purposes. A laboratory check by one manufacturer indicates that such a loop has negligible surge impedance.

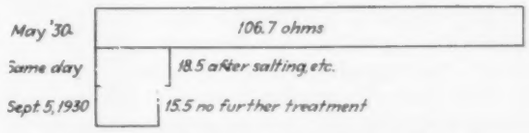


Fig. 4—Salted ground improves with age

Average for eighteen grounds at Cazenovia after four months' saturation.

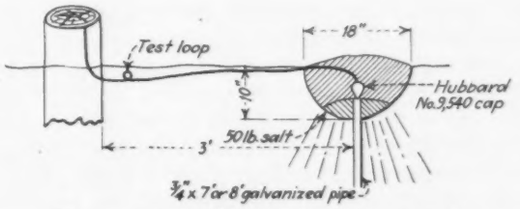


Fig. 5—A good type of rural ground

A careful check on the resistance of 50 grounds before and after the treatment outlined above shows little difference between galvanized pipe and copperweld steel rods of comparable size. It is not the intention to praise either at the expense of the other. It is felt that each has its own particular advantages which will recommend it for particular conditions.

Salt lasts long in hard soil

The question of the permanency of the salt treatment is a vital one to all interested in grounds. In general, it may be safely stated that the treatment is much more permanent in a dense soil than in a loose one. Data from the Atlantic seaboard indicate that salt treatment even in sandy soils gives an effective life of two or three years. In dense, hard soils it is felt that a much greater life can be reasonably expected.

By far the most important point in obtaining proper protection is getting a good ground. Investigation has shown that many arresters are placed on grounds having 200 to 1,500 ohms resistance. Obviously such arresters were better left in the stock room, as they cannot be expected to function. The best practice is to test the ground when it is placed and before placing arresters. If it fails to measure less than a predetermined maximum value resistance it must then be brought within the limit by treatment, additional rods or changing to a longer rod. If resistance cannot be brought down for a reasonable cost arresters are best omitted from that particular location.

There are many factors to be considered in deciding what is a "reasonable cost" of a ground. Some are size of transformer, number of customers, character of load, likelihood of lightning trouble in the particular area, etc.

Some companies are adopting the practice of having each line crew, whose duties include placing grounds, carry a small, inexpensive instrument for testing. Procedures are being worked out as to just what a foreman should do if he finds a ground over a certain value. In some cases he is supposed to exercise a certain amount of initiative, while in others he is expected to refer the matter to a superior for instructions.

In conclusion, it should be noted that many companies are making a real study of the lightning problem as well as a determined effort to obtain real grounds and real protection. Some few others are still placing arresters on unmeasured and doubtful grounds, apparently with the same faith as that of the man who puts a horseshoe on his door lintel to keep out evil spirits, and probably with as much effect. With satisfactory testing equipment available at a cost of less than that of one burnout, it is difficult to justify such practice.

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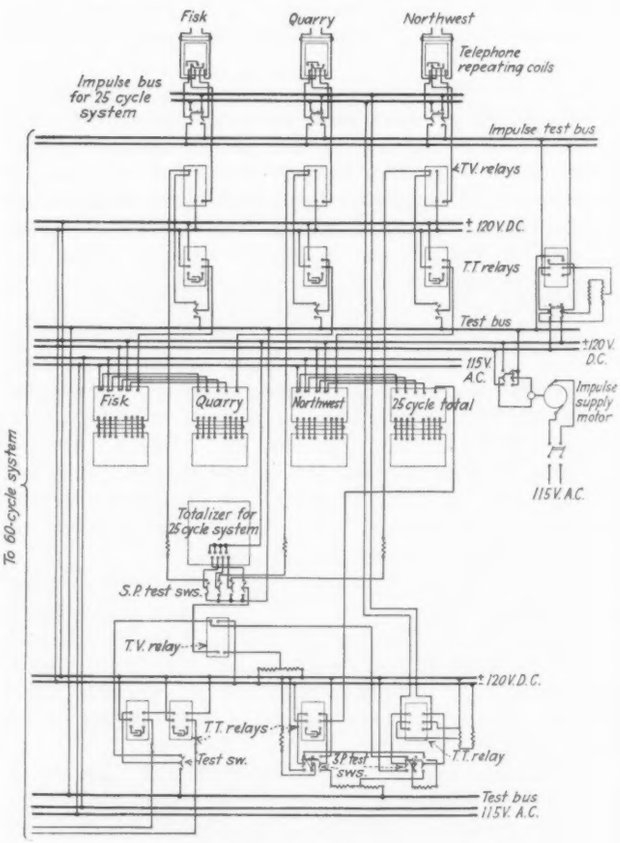
Remote Metering System Calibrated Quickly

By URIAH DAVIS
Assistant Chief Load Dispatcher
Commonwealth Edison Company

All of the recorders, totalizers, relays and associated equipment in the impulse remote metering system on generating station outputs of the Commonwealth Edison Company can be given checking calibration from the office of the load dispatcher. This innovation was accomplished when the office was rearranged and enlarged from its previous cramped quarters, at which time the revision of remote recorders was described in the ELECTRICAL WORLD.

The checking equipment, as shown in the accompanying diagram, consists of an impulse supply and a set of permanently installed test buses to which instruments to be checked may be connected by means of double-throw switches. The impulse supply is simply a contactor driven by a synchronous motor through a variable chain of gears by which impulses of from 10 to 640 per minute may be obtained. Any instruments in the system, including the distant recorders in the generating stations, can be checked singly or in groups as desired. The check of a recorder, for instance, requires only the connection of the particular instrument to the test bus by means of the double-throw switch. Then a definite number of impulses is impressed on the test circuit and the recorder should indicate the load corresponding to the impulse rate. If the recorder to be tested is located in a generating station the station operator is instructed by telephone to disregard the reading of the impulse watt-hour meter and report back to the load dispatcher the reading of the recorder after it has come to rest.



Local and long-distance meter testing

Impulse remote metering system instruments can be checked from load dispatcher's office of Commonwealth Edison Company. This diagram shows only the 25-cycle part of the meter system.

Thermal Demand Meters Give Good Account of Themselves

By DANIEL A. HILL
Commercial Engineer Ohio Public Service Company, Cleveland, Ohio

Experience of two years indicates satisfaction.

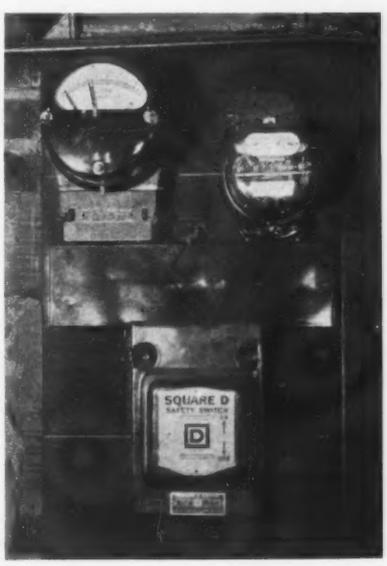
More equitable distribution of demand costs between customers.

Data not yet sufficient to prove effect on revenue.

Problems of installation and testing not difficult.

FOR about two years the Ohio Public Service Company has been using Lincoln thermal type meters for the determination of demands of commercial lighting customers. So far approximately 1,300 of these instruments have been installed and their economy and performance studied. From this experience has come the conclusion that the use of this type of meter results in a more equitable distribution of charges to customers and an over-all fairer revenue to the utility. At the time the commercial lighting rates of the Public Service Company were filed it was thought that continuous measurement of demand would be impractical because of the expense involved. The difficulties attending the administration of such a rate schedule by checking connected load or by occasional measurement with indicating meters or with graphic instruments was fully appreciated, yet the definite advantages of a demand charge form of rate appeared to outweigh these disadvantages.

The anticipated troubles in establishing demand materialized and the desirability of continuously metered demand became more and more apparent. A considerable number of demand attachments of the synchronous-motor timed-block-interval type were installed on the watt-hour meters of the larger customers. This method of obtaining demands was reasonably satisfactory in these cases, but the expense of maintenance made the cost prohibitive for use on smaller customers. The general practice, therefore, was to establish a demand at the time a customer began service by a check of connected load. A stop watch and a meter disk check was then made each year some time between November and February. The customer also periodically checked demand and kilowatt-hour usage and in cases when the hours' use of demand appeared high a check was requested. Similar requests were issued by the new-business department when additional equipment was installed or when it appeared that the billing demand was too high. These demand checks for the most part were made by timing the revolutions of the watt-hour meter disk with a stop watch at a time when the customer's load appeared to be a maximum.

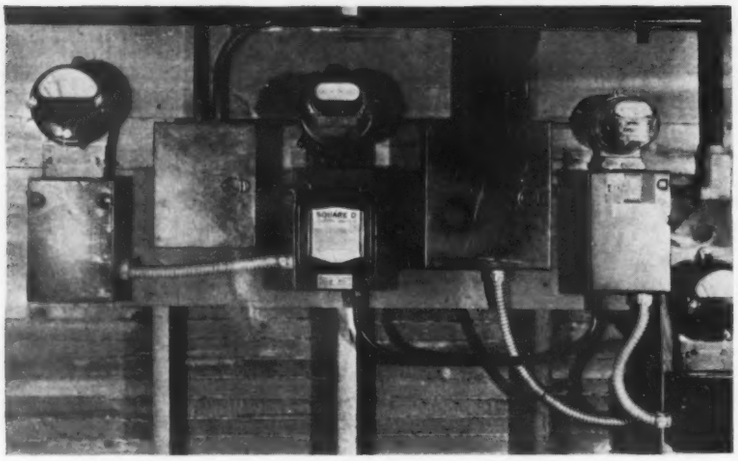


Double trim installation

In May, 1929, a study was made of the Lincoln thermal demand meter, which had just been placed in production in the United States. Tests were made on meter losses, effect of power factor and ambient temperature on registration and on the demand registered when compared with timed-block-interval meters. Particular attention was given to the construction of the meter with regard to its probable maintenance cost. As the results of these tests were satisfactory it was decided that these thermal demand meters be installed for all commercial lighting customers having a demand estimated to be 1,100 watts or more.

A relatively small number of sizes of demand meters has been found necessary. On two-wire service nothing smaller than 30-amp. meters are installed. On 115-230-volt, three-wire installations some 15-amp. demand meters are used. Five sizes of self-contained meters and one meter for use with current transformers handle practically all sizes of installations. It is possible to obtain a six-terminal meter that can be used with either a three-wire current transformer or with two two-wire current transformers. Installation is handled by the regular meter crews. The number of installations made each month varied with the amount of routine testing and other regular work.

The testing of these meters is somewhat more difficult than the testing of watt-hour meters. It is necessary to bring the temperature of the meter elements to a steady condition by energizing the potential coils for ten or twelve hours previous to the tests.



Multiple installation

A rack, accommodating twelve meters, wired with potential leads provides a means of testing this number of meters at one time. A batch of meters is placed on the rack, the current elements are connected in series and the potential leads are attached. The potential is applied and the meters allowed to remain over night. A regular States test table is used to apply the load. The length of the test period is usually 45 minutes, with a check of the registration at fifteen and 30 minutes.

Field testing will probably be impractical because of the time required. The few meters which have been returned to the shop after having been in service from a few months to somewhat over a year showed a satisfactorily maintained accuracy. Canadian practice is reported to be a six-year test period. No decision as to the length of the routine test interval has as yet been made by the Ohio Public Service Company.

Most of the problems of installations were those of finding space in which to mount the meter. Where the room on the meter board permitted, the cheapest and most convenient method of mounting was found to be the use of a double trim which accommodates both the watt-hour meter and the demand meter. This method eliminates the necessity of a separate box for the demand meter and makes a neat and easily wired installation. This double trim is now available from the Square D Company. In cases where it was not possible to use a double trim a small box was set and the connections were made through flexible or rigid conduit. Entrance switch boxes without the switches were most generally used.

The effect on revenue

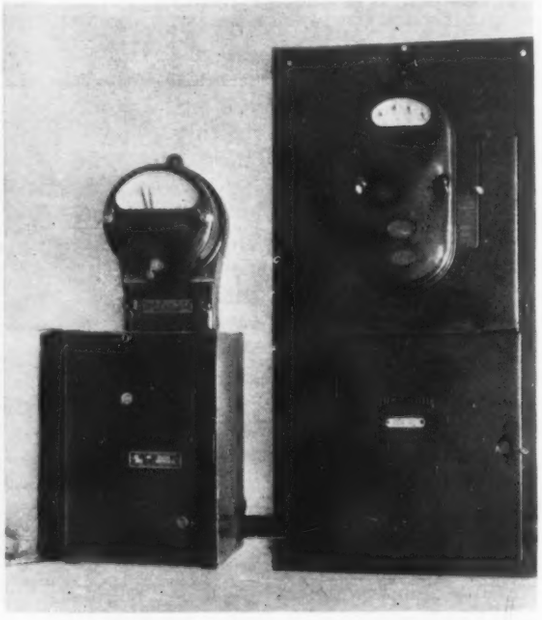
A sufficient number of the demand meters have not been in service long enough to permit an exact statement of the effect which their use will have upon the revenue derived from the demand charge. A comparison of metered demands with the billing demands in one district showed that the sum of the metered demands were 6½ per cent higher than the sum of the billing demands. This difference represents an appreciable amount of money, but it is perhaps less important from the customer's standpoint than the variations between metered demand and billing demand of individual customers. Here the differences frequently were much greater than those of the whole group taken together. In the group mentioned above, on the basis of demands registered in the period from January to June, 1931, a reduction in demand charge would be given to 20 per cent of the customers; 12 per cent would be unchanged, and 68 per cent would be increased. These figures would probably differ somewhat if all the commercial customers served by the company were included and if the metered demands were available for a full year. As they stand, however, they are a fair illustration of what may be expected.

Mention might be made here of the character of the demand interval registered by this meter. The indication of the meter at any time is the resultant of the heat liberated in the heater elements and the heat radiated from them. This meter, therefore, registers what is in effect a weighted moving average of infinitely small time intervals. This weighting follows an exponential curve, the more remote in time the less the effect of that time interval. The meter regularly supplied has an interval characteristic such that on a steadily applied load a reading of 90 per cent of the applied load will be registered after fifteen minutes, 99 per cent registration after 30 minutes and 99.9 per cent registration after 45 minutes.

The particular rate schedule under which these meters are used by the Ohio Public Service Company contemplated what was essentially an instantaneous demand. The Lincoln meter does not, of course, give such a demand. Experience seems to indicate, however, that the character of the load of this class of customer is such

For kva. demands

This is a three-phase power installation using a phase-shifting transformer and thermal demand meter for direct registration of kva.



that peak loads are repeated and that the registrations of this meter and that of block interval meters of fifteen-, minute, 30-minute or even 60-minute periods are not greatly different after they have been in parallel for a period of time.

Use on small power service

A problem somewhat similar to that of metering the demands of commercial lighting customers is the demand metering of small power customers. In the case of the power customer, however, there is the additional problem of power factor. Little argument is needed to show that the logical demand charge for a power customer is one that is based on kilovolt-amperes rather than on kilowatts.

The thermal demand meter used with a phase-shifting transformer provides a convenient method of obtaining kilovolt-ampere demands. The initial cost of installation is considerably less than other types of direct kilovolt-ampere reading; equipment maintenance is lower, and the expense of handling charts may be avoided if desired. The meter used for kilovolt-ampere registration is of the same general construction as the single-phase meter used for obtaining kilowatt demands.

At the present time the practice of the Ohio Public Service Company is to use this type of equipment on power customers having demands from 35 kva. to 200 kva. This group of customers was formerly billed on a kilowatt demand basis and power factor adjustments were not made unless the average power factor was below 0.80 or over 0.90, when the billing demand was adjusted to an 0.85 basis. Larger customers were and are at the present time equipped with meters of the Westinghouse duplex RA or RI type of recording meters.

Installation a minor problem

The problems of installation of these kilowatt-ampere meters were much the same as those met with in installing the single-phase meters. The box into which the meter is trimmed must be deep enough to accommodate the phase-shifting transformer. The Ohio Public Service Company uses a metal panel and box combined, made by the Superior Switchboard & Devices Company (the A-10 Superior meter device), on many installations of these sizes. The regular box on the A-10 device is not deep enough, but extra-deep boxes may be obtained. In some cases a meter device with a deep box is set alongside a regular device on which the watt-hour meter is set. In other cases a small plain box is set alongside to contain the phase-shifting transformer and into which the Lincoln meter is trimmed. The phase-shifting transformer is purchased fitted with 36-in. pigtails. This permits making the connections without splices.

Lincoln phase-shifting transformers are regularly supplied with taps for three different power factors. These transformers are tapped for 0.70, 0.82 and 0.92 power factor or for 0.82, 0.92 and 0.98 power factor. The former will give a registration within 2 per cent accuracy from 0.50 lag to 0.97 lag; the other registers within 2 per cent between 0.68 and unity lag. It is necessary to have some knowledge of the approximate power factor of the customer's installation at the time of maximum demand. If this power factor is not known it is usually obtained by temporarily setting a graphic power factor meter.

Unit Data on Distilled-Water Ice Plant

By R. H. PARRISH
Mission, Tex.

The observed data on equipment installed and cost data on a typical South Texas distilled-water ice plant with capacity of 90 tons per 24 hours, using the can system, may be of value to other similar sized plants as a means of comparison.

The compressor room equipment consists of two vertical 16x24-in. double-cylinder, single-acting ammonia compressors with a full speed of 70 r.p.m. Each compressor has a rated capacity of 45 tons per 24 hours when operating at 15 lb. suction pressure and 185 lb. condensing pressure and with cooling water at 70 deg. F. (21 deg. C.). Each compressor is belt-driven by a 175-hp., three-phase, 60-cycle, 575-r.p.m., 2,200-volt, variable-speed slip-ring type motor. The motor control is of the manual drum type, with grid resistance units such that motor can run continuously on any of the intermediate steps, thus giving a speed range of full to one-half full speed. There is also a 6x6-in. ammonia compressor installed in the compressor room having approximately 4 tons capacity and driven by a 10-hp., 900-r.p.m., three-phase, 60-cycle, 440-volt variable-speed motor. This unit is used for pumping out the ammonia system, testing and general repair work, thus eliminating the necessity of starting and running of one of the larger units for this work.

The auxiliary equipment in the compressor and tank room consists of four brine agitators, with 5-hp., 900-r.p.m. vertical, constant-speed motors direct connected, one condenser water pump with 25-hp., 900-r.p.m. variable-speed, belt-drive motor, one soft water pump with 5-hp., 900-r.p.m. variable-speed geared motor, one distilled water pump with 5 hp., 900 r.p.m. variable-speed motor, one boiler feed pump with 5-hp., 900-r.p.m. geared motor, one water softener mixer with ¾-hp., 900-r.p.m. belt drive motor and two cranes with a 3-hp., 900-r.p.m., variable-speed motor on each.

Twelve months' observed data on tons output and kilowatt-hour input are as follows:

	Tons Output	Kw.-Hr. Input	Kw.-Hr. Input Per Ton
January	2,030	92,475	45.5
February	1,496	65,071	43.5
March	1,741	71,880	41.2
April	3,061	133,520	43.7
May	3,740	139,472	37.3
June	3,280	145,664	44.7
July	3,641	157,630	43.3
August	3,562	156,714	44.0
September	3,396	160,240	47.0
October	2,972	154,064	51.8
November	1,790	76,455	42.6
December	2,195	91,140	41.5

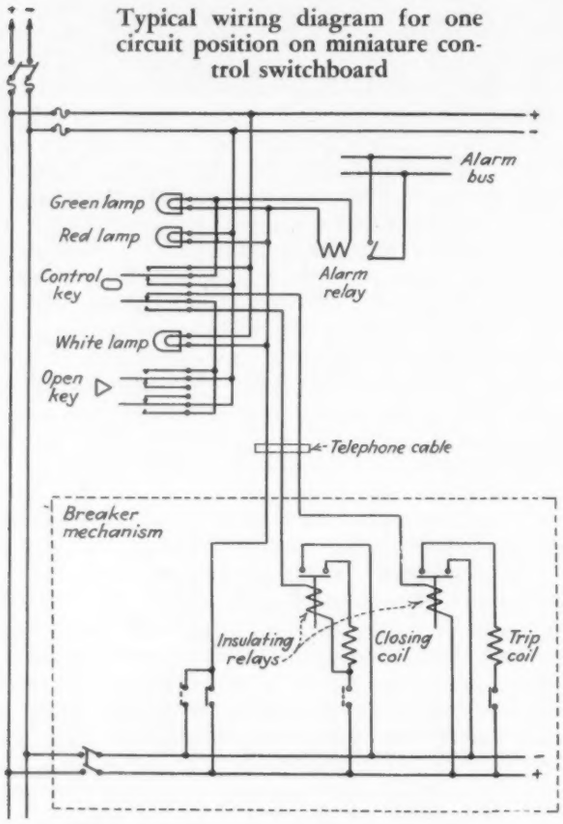
The average number of kilowatt-hours per ton of ice made is 43, average tank room labor is 27.2 cents per ton, average engine and boiler room labor is 33.5 cents per ton and average cost of fuel is 21.6 cents per ton. With an average cost of purchased electric power of 1.9 cents per kilowatt-hour the total items of cost above amounts to $1.64 per ton of ice made.

Miniature Control Meets Need in Switchboard Design

By G. E. FARMER

Department of Engineering Design,
Southern California Edison Company, Ltd., Los Angeles, Calif.

Typical wiring diagram for one circuit position on miniature control switchboard



SWITCHBOARDS of the conventional type have been gradually becoming inadequate as the modern generating station and its associated transmission substations have increased in size. They have become large and inconvenient to operate and distances from the equipment to be operated and the control room have greatly increased. For these reasons and the desire to reduce the unit cost for substation construction engineers have been working on a more convenient type of switchboard which will operate over these extended distances without sacrificing any of the functions provided by the common type of switchboard. This has resulted in the development of miniature remote control and metering equipment.

The fundamental element of miniature remote control has been in use with supervisory control equipment for some years and consists principally of telephone apparatus adapted to control purposes. The maximum advantage of miniature remote control is derived by grouping the apparatus to be controlled together with its operating mechanism, protective equipment and the necessary low-voltage and low-current isolating relays as a compact unit. The complete unit may consist of one piece of apparatus or several with a common relay location. The isolating relays are connected to the low-voltage control switches at the control center by standard multi-conductor telephone cable. The miniature indicating meters are connected through the same type of cable to special low-voltage instrument transformers or to the standard instrument transformer circuit through auxiliary current or potential transformers located at the apparatus unit.

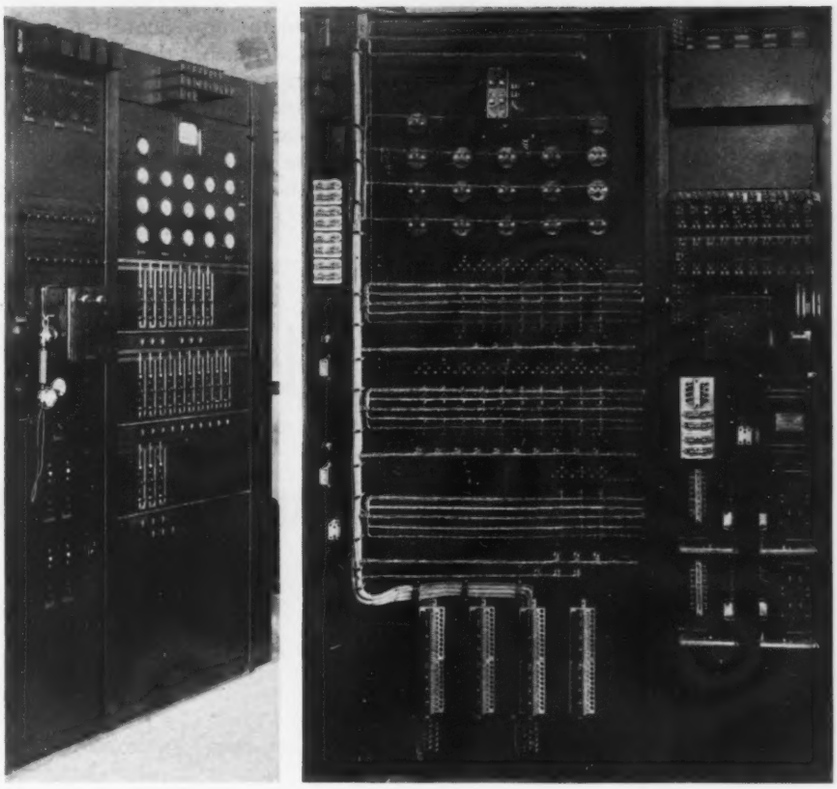
The most important advantage which justifies the growing demand for miniature remote control equipment is its possible economy over other available forms of remote control. This economy is due principally to reduction in size of the control room and the grouping of circuits in multi-conductor telephone cables, thus eliminating a large number of more expensive cables and their associated duct runs. The possible additional complication caused by the isolating relays and auxiliary transformers is more than offset by the localizing of the operating and protective relay circuits, which are compact, short and readily accessible.

This type of equipment has great possibilities in solving the problem of making additions to existing stations where they are congested or where the control room is of insufficient size to permit an addition to the switchboard in its present form. Moreover, the most convenient geographic location for the control house may be selected as reasonable variations in distances from the apparatus to the control equipment have little effect upon the cost or operations of this type of equipment.

Field of application

In selecting the type of control equipment to be installed in a substation two general conditions must be considered: First, whether an existing station is to be rebuilt or enlarged and, second, whether an entirely new station is proposed. It is in this first group that engineers of the Southern California Edison Company, Ltd., have made use of miniature remote-control equipment. At the present time there are four substations in this system which are equipped or are being equipped with this type of control equipment in one form or another. One substation has a complete change from hand-operated control to this type in an existing building, while the others have the equipment in new buildings, replacing old equipment.

For analysis in proposing remote control for future substations on this system the substations are divided into three groups: First, the major or 220-kv. transmission substations; second, secondary or 66-kv. transmission substations; third, distribution substations.



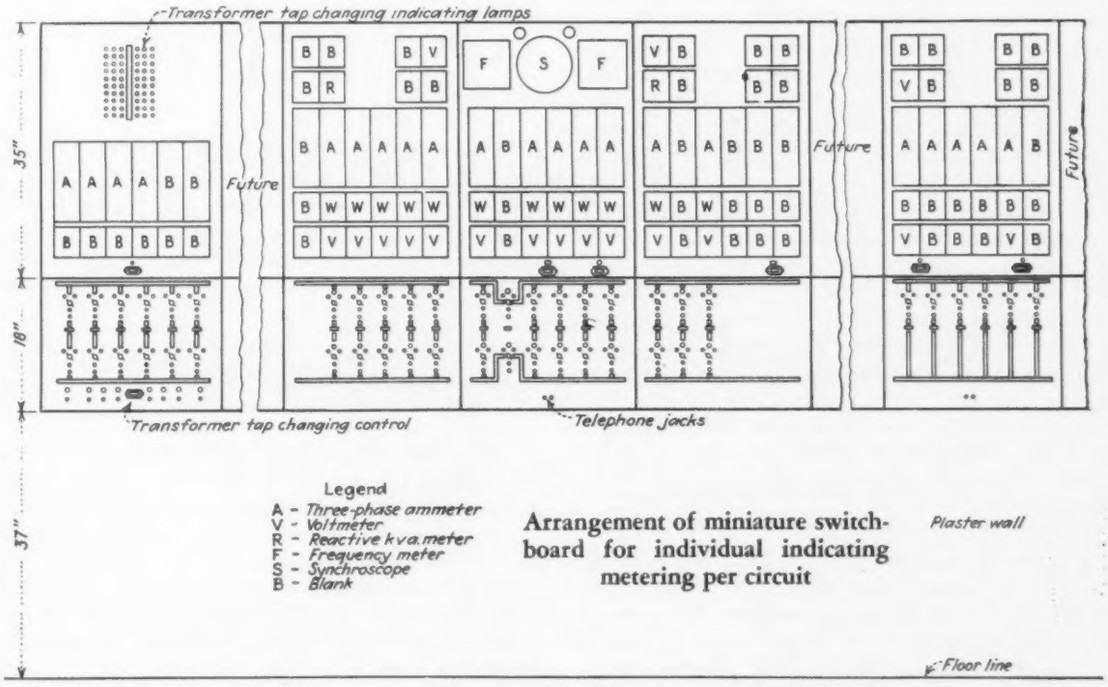
Front and rear views of miniature control board showing compactness and simplicity of apparatus and wiring

In the first group the station equipment is spread over a great area and there are a large number of units to be controlled over long distances. It is with this type of station that the economy of miniature remote-control equipment is more pronounced through reduction of switchboard size, the smaller control room needed and in the extensiveness of cable layout required.

In the second and third classes of substations the use of miniature control equipment may or may not show a saving over the conventional type. It is in these classes that the proposed miniature control equipment using the conventional type of circuit but with smaller control switches will have the advantage at such time as the equipment is obtainable from manufacturers. With this equipment the isolating relays are eliminated, but at the same time the telephone cable must be replaced by numerous control cables having larger conductors. Thus the selection between the two types of equipment depends almost entirely upon the cable lengths.

After the decision to use miniature remote-control equipment has been made it is necessary to consider the form of switchboard to be used. Due to its great flexibility, a great variety of arrangements are possible. The stations may be grouped into those requiring individual indicating metering per circuit and those permitting group metering.

The first arrangement requires a rather expanded board as it does not lend itself conveniently to the use of more than one horizontal row of control and indicating positions. However, this arrangement may be either of the desk or panel form. The arrangement of one of these panel type switchboards that is being installed in



Arrangement of miniature switchboard for individual indicating metering per circuit

a major 220-kv. substation is shown in the accompanying drawing. The second group permits design of a much more compact board as shown by the accompanying illustrations. This type makes best use of a panelboard with a number of horizontal rows of control switches, indicating lamps and metering keys and with the group-indicating meters at the top. The rear view of the board shows the wiring, which is standard telephone switchboard wire and cable. The typical schematic wiring of this installation is shown by the accompanying diagram.

These switchboards were built in the shops of the Southern California Edison Company, Ltd.

Installations of miniature remote-control equipment already made have apparently fulfilled all expectations and present indications are that this type of equipment will be used much more extensively in the future.

▼ ▼ ▼

Home Lighting— an Unsaturated Market

By EARL A. GRAHAM
E. E. Free Laboratories, New York

Easiest and best business possibility in electrical industry.

Available market of $1,200,000,000.

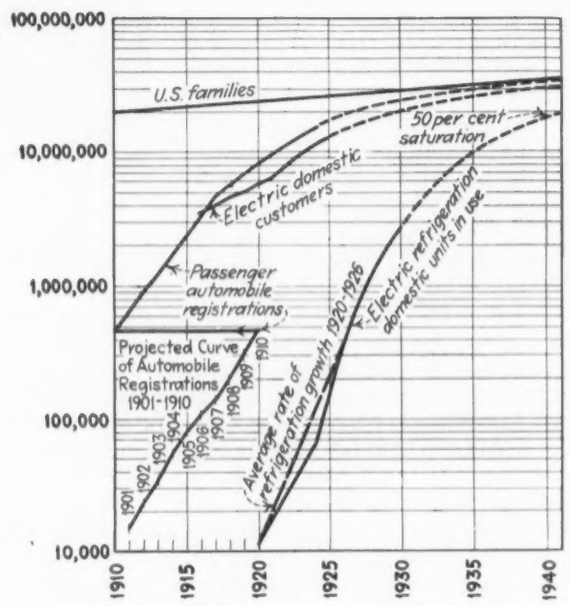
Detail analysis

LIGHTING saturation in domestic and commercial fields is shown by careful research to be less than 30 per cent of the level considered at present to be minimum good practice; 17 per cent of the standard recommended for safe and satisfactory illumination; 13 per cent of the probable level of greatest economic advantage, and the 3 per cent of possible desirable levels from eye and health considerations alone.

The attainment of the present "minimum good practice" level in the homes of the country would more than double present revenue from domestic lighting, so this level of saturation is taken as the immediate objective for consideration.

The time required to reach this objective depends largely on the nature of the efforts made in that direction. The rate of growth is exceedingly slow under the present lack of co-ordinated and properly planned effort. Results similar to those obtained by intensive work in other industries should be secured. The automobile industry reached a stage of virtual saturation, as shown by the accompanying illustration, in less than twelve years from the time it was on a 30 per cent saturation level. Nine years should be ample time for the electrical industry to secure equivalent results in the lighting field.

A three-year campaign should cover one-third of the distance, so this accomplishment is taken as the immediate objective for the proposed drive. There are approximately 21,000,000 domestic electric customers in the United States, so, on the above basis, 7,000,000 should be brought to the saturation level assumed herein.



A rough picture of the total possibilities involved in bringing all of the lighting customers in American homes up to the minimum saturation level is given below:

Domestic customers, 1930	20,438,000
Energy used in homes, total kw.-hr	12,000,000,000
Energy used for lighting, estimated kw.-hr	10,000,000,000
Lighting saturation, present minimum good practice standard, per cent	30
Increased energy estimated necessary to bring light levels up to present minimum good practice standard, kw.-hr	24,000,000,000
Possible additional revenue at 4 cents per kw.-hr	$960,000,000
Per lighting customer (domestic)	$36

This takes no account of the steady growth of lighting customers which in the next nine years should amount to some 9,000,000, assuming continuance of the present growth rate for United States families, as shown on the attached curve, nor does it include commercial possibilities, which are equally great.

A campaign of nation-wide extent would naturally reach and affect all lighting customers to some extent or other, but for estimating purposes it is considered that

on the average one-third of the lighting customers in the country would be brought up to the "minimum present good practice" standard of lighting. The assumption and estimated results are:

Number of domestic electric customers to be reached in the campaign	7,000,000
Saturation level to be, "minimum present good practice," per attached survey, average, foot-candles	10
Added annual energy consumption, kw.-hr.	8,400,000,000
Average rate step for increment business, cents per kw.-hr.	3
Added yearly revenue, domestic lighting	$252,000,000
Per customer	$36

As the business would be added progressively during the entire period it is conservative to estimate that the total results of energy sales for the three years would amount to one year's revenue, or $252,000,000.

Better lighting requires better fixtures and, in turn, their installation and necessary changes in housewiring. The manufacturer, the wiring contractor and the various vendors of electrical goods all have a stake in this project, which may conservatively be estimated as below:

Estimate for the average installation:	
Fixtures, lamps, etc.	$55.00
Wiring materials	5.00
Labor, installation, etc.	10.00
Total per customer, average	$70.00
Total for three-year campaign, 7,000,000 customers	$490,000,000

In addition to the money released for purchase of electric service and the necessary fixtures, etc., in which to utilize it there would be expenditures for additional generator, line and distribution equipment of at least $500,000,000, giving a total of around $1,200,000,000 that a three-year campaign of this nature would put into productive circulation.

Most merchandisers would consider themselves fortunate if they could get business on a 10 per cent selling cost basis. On this basis the justifiable expense for securing the utility revenue indicated above would be $25,200,000. With this amount and with the expenditures that the manufacturers of lamps, fixtures, etc., and other interested parties would normally consider their reasonable expense of getting business it would seem that almost any kind of a soluble problem could be worked out.

Relative Revenue Building Possibilities per Dollar Initially Invested by the Consumer

(E. W. Commery, N.E.L.A. Park)

Article	Average Retail Price	Annual Revenue	Annual Revenue per Dollar Spent for the Device
Lamps*	$0.20	$0.78	$3.79
Irons	4.59	4.32	0.94
Cookers	6.79	6.00	0.88
Indirect-floor lamps†	25.00	18.00	0.72
Toasters	5.50	3.00	0.55
Heaters	4.75	2.40	0.51
Ranges	150.00	60.00	0.40
Percolators	4.74	3.00	0.39
Waffle irons	7.78	1.80	0.23
Refrigerators	255.00	26.40	0.11
Ironing machines	76.00	7.50	0.10
Fans (desk)	14.00	0.96	0.07
Cleaners	55.00	2.16	0.04
Washing machines	104.50	1.44	0.01

* Based on 40-watt lamps in average sockets.
† 300-watt lamp burning 1,000 hours per year.

Even though the utilities would probably be justified in spending 10 cents out of the first year's dollar to sell the idea of real illumination in the home, we believe that the job could be done with an "out-of-pocket expense" of half that amount if the campaign were properly planned and its execution were given wholehearted co-operation by all concerned.

The capital investment to serve this increment business should not exceed $3 per dollar of gross added. Annual charges at 11 per cent would be 35 cents and adding the 5 cents selling cost would give a total of 38 cents cost of business, leaving 62 cents for energy cost and additional margin during the campaign period and 67 cents per year thereafter.

One of the great problems of modern business is to find markets that do not have a high degree of saturation

A Billion Dollar Market

About two-thirds of the homes in the United States are now served with electricity. The use of light in these homes, however, is below one-third of the illumination level indicated by present good practice as a minimum requirement. Home-lighting saturation, therefore, is not over 30 per cent and competent authority has estimated it at 17 per cent.

Even at the 30 per cent basis an energy market estimated at around 24,000,000,000-kw.-hr. is available in this unsaturated field. At present rates this would return more than $1,000,000,000 annual revenue.

At least one-third of the homes are good early prospects for adequate illumination. Their requirements would add at least $250,000,000 yearly gross to utility revenues and would provide an additional market for lamps, fixtures, wiring, etc., of around $490,000,000, besides calling for the expenditure by the utilities of some $500,000,000 for station, line and distribution capacity to serve the business.

The opening up of new outlets for the productive energy of the country is a fundamental requirement to the improvement of business conditions. Here is an ideal outlet; low saturation, cheap and desirable service, low first cost, country-wide distribution of activity and large volume. (More than $1,000,000,000 involved.)

The financial burden on the individual customer would not be heavy; about $106 for investment and service the first year and $36 yearly thereafter, compared with $1,200 and $400 for an automobile and $250 and $36 for an electric refrigerator.

The demand for increased light is backed by all medical and social authorities. This demand is latent in the public mind. To crystallize it requires the proper dramatization of the advantages and needs of more light. The key to the business created by this demand is effective organization of existing merchandising media.

"What is everybody's business is nobody's business." Increased lighting will come anyhow, but it will come slowly, as it has in the past, by being "everybody's business." If the leaders of the electrical industry make it *their business* to see that the proper effort is made now, the industry will profit by the increased earnings and the country at large will benefit by the stimulus to productive effort. Indeed, such a campaign might easily set forces in motion that would lift us up out of the slough of depression.

and which are, at the same time, of importance sufficient to merit the work required to win them. Here we evidently have a market and a product that ideally fill the requirements for organized effort—low saturation, low unit expenditure by the customer, general acceptability and need, great potential volume, and with interested parties equipped financially to make the effort required to win the market.

If we look for a single commodity to take the place of the automobile in wealth production, we look in vain, for there is nothing on the horizon except the electric refrigerator, and that is already contributing its share. "Home improvement" is the great unsaturated market and the one most susceptible of rapid development at low unit cost to all concerned. The elements of this market are many, but the one probably most easy to develop and that will give the greatest return is better lighting.

As the clogging of the rivers of distribution by the saturation of the automobile, the building construction and other markets has been one of the prime causes of the recession of business, would not the opening up of new channels for the flow of productive energy help start the current of prosperity moving again? We believe it would, and that an activity such as outlined herein is one of the most practicable channels of this nature readily available.

Refrigeration sales a measure of possibilities

The progress of the home refrigeration business during the past three years, half of which time has been under the depression influence, gives a valuable indication of the possibilities latent in an active development of the lighting business. A comparison of actual refrigeration campaign results for the past three years with our estimate of results from a similar lighting campaign is given below:

Refrigeration, Domestic Field

1,920,000 units sold in 1928, '29 and '30.

Equipment cost, estimated average unit $200	$384,000,000
Utility revenue, estimated total for the three years, at $36 yearly rate	80,000,000
Total for the three years	$464,000,000
Per customer	$240

Lighting Campaign, Domestic Field

7,000,000 domestic customers involved

Equipment and wiring cost, estimated average $70	$490,000,000
Utility revenue, estimated total for the three years at $36 yearly rate	252,000,000
Total for the three years	$742,000,000
Per customer	$106

The sales resistance hurdle of high first cost obviously is much lower in the case of the lighting business than in the sale of domestic refrigeration.

The apparent ease with which this hurdle has been taken by domestic refrigeration, even under the handicaps of being a new article, of defective pioneer equipment, changing models, imperfectly organized effort and depression for a good part of the period noted, gives an indication of the probable success of a properly planned and executed lighting campaign, depression notwithstanding.

The above indicates the existence of an important opportunity not only to increase the scope of electric service and the earnings of the utility companies, but also to start loosening the pursestrings of the country and thereby to aid in its economic revival.

Can this opportunity be utilized? The answer to this question can be given by a relatively small number of men, the leaders of the electrical industry.

The key to the opportunity is public psychology. The average American must be persuaded that it is advantageous to use more light. It is not enough to prove this as a fact. The fact must be dramatized. Such dramatization of facts is one of the outstanding developments of modern marketing, as evidenced by the activities of many of our most important industries which have added notably to their earnings and prestige by the use of such methods.

Light has a better case for presentation that has most other services commonly used. The need is proper and adequate presentation and action.

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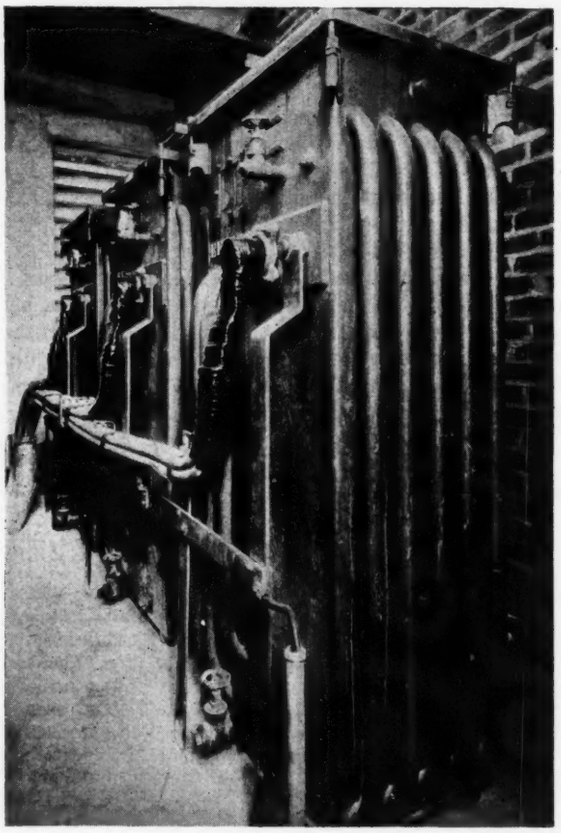
Subway Transformers Conserve Office Building Space



Floor space with rental value is at a premium in tall office buildings and the electrical installation is expected to contribute its quota to space conservation, especially in buildings tall enough to require substations on upper floors. The accompanying illustration indicates the compactness possible from the use of subway type transformers (200 kva. each) due to the subordination of floor area to height. The installation shown is one compartment of the 41st floor vault of the Empire State Building in New York City.

Distribution Costs Derived by Survey

—Each circuit analyzed by engineers.
—Major results check closely.
—Method applicable to whole distribution system.

APPORTIONMENT of the investment in the distribution system of an operating company is one of the most common difficulties encountered in cost analysis work for electric utilities. The main problem in properly segregating distribution investment is that of dividing it among the various classes of business served. In lieu of exact data this is generally done by dividing this investment by assumed percentages, but this invariably brings up the question of the accuracy and proper basis for these percentages, which usually contain a factor for customer density and another factor based on the demand of the customers in each class.

A method giving greater accuracy has been developed within the last few years in conjunction with engineering surveys of the distribution plant and their correlation with the uniform classification of accounts. In representative cases the figures obtained by co-operating efforts have checked within about 10 to 15 per cent of the total distributing investment, amounting to several millions of dollars in rate base assembly and even closer in many individual sub-total items. The remainders could be adjusted by percentage with minimum error.

For the material presented below in illustrating the application of this method in a normal case the ELECTRICAL WORLD is indebted to Col. C. F. Lacombe, of Lacombe & Leffler, New York City, who has contributed much to progress in public utility cost analysis during the past decade. For the sake of simplicity the material will be confined mainly to the procedure as used to determine distribution system investment for residential service.

In a given distribution system it is common to find the distribution lines used for the following services: Residential, commercial lighting, commercial or retail power, wholesale power, municipal street lighting, and other utilities. It is not difficult to get the investment in the lines to other utilities and municipal street lighting and it can also be very closely obtained for the large power users. This would leave the remainder to be determined for the first three and part of the fourth class of services. In several cases the problem was met by the following method:

Arbitrary percentages unsatisfactory

In determining the distribution of this balance, dissatisfaction arose in connection with the method of allocation among these four classes by arbitrary percentages of the distribution costs, consisting of overhead lines, poles, etc., and underground conduits, conductors, transformer costs and the like. Endeavor was therefore made to obtain from company engineers on the operating property, familiar as they were with the distribution system, fairly accurate surveys of the existing lines and the classes of service which these supplied. After the engineers learned what was desired, patient effort, sur-

Typical Field Sheet for Circuit Cost Allocation

Circuit No. 2029-WH	Under Ground	Overhead	Total
Value	$5,596	$14,061	$19,657

Connected Transformers

Classification	No.	Total Kva.	Per Cent of Total	Value
Residential	8	68	16	$612
Commercial	11	150	34	1,350
Industrial	12	221	50	1,989
Total	51	439	100	$3,951

Connected Services

Classification	No.	Value
Residential	145	$981
Commercial	26	202
Industrial	22	556
Total	193	$1,739

Circuit Loading

Classification	Circuit Demand, Kw.	Per Cent Usage of Line
Residential	58	7
Commercial	30	12
Industrial	380	81
Total	468	100

Value

	Account Numbers						
	U. G.	O. H.	O. H.	U. G.	Services	Transformers	
Classification	330	331	332	333	335	336 and 337	Total
Residential	$304	$287	$299	$88	$981	$612	$2,571
Commercial	521	491	513	151	202	1,350	3,228
Industrial	3,513	3,316	3,465	1,019	556	1,989	13,858
Total	$4,338	$4,094	$4,277	$1,258	$1,739	$3,951	$19,657

U. G. = Underground.
O. H. = Overhead.
330, 333 Underground circuits (conduits and conductors).
331, 332 Overhead circuits (poles, wires, fixtures).
335 services.
336, 337 Transformers and installation.

veys, circuit maps, work orders, unit cost data and skillful use of their understanding of the local system developed information so accurate that the sum of the charges turned in for each class of service nearly reached 100 per cent of the total of the recorded investment in the distribution system.

This procedure took several weeks in concrete examples, but was well worth the trouble since it removed from the segregation of costs a large element previously distributed in estimated percentages, which, at best, fell into the class of educated opinions. By the method above referred to the costs were placed where they belonged in a manner susceptible of proof.

Once customer and distribution costs are ascertained with reasonable accuracy, there is little else in cost analysis which does not fall within the generally accepted Hopkinson demand theory.

In commission proceedings it is not infrequent to encounter the criticism of a company rate base allocation to the effect that too much of the distribution investments have been charged to the residence and commercial lighting classes and too little to the power classes, particularly large competitive power customers. In view of the many separate distribution systems that often make up the total investment in this item of distribution, overall percentages appear to be a poor reliance. Actual surveys by company engineers of distribution lines afford material for closely approximating the investment in lines used to serve each class of business.

Procedure in analyzing residential service

In the analysis just mentioned it was of course desired to determine the total investment chargeable to the residential service, as a part of a cost analysis covering all classes of the company's business. The method of procedure used in finding the distribution investment due to domestic service typifies the routine which had to be followed in order to ascertain the proportion of this part of the system investment as a whole devoted to home use of electricity or to other services.

It was known from one company's records that its total transmission and distribution system investment was $16,250,000 as of a stated date. The cost engineering problem was to break down this total into costs due to the classes of business already mentioned. It was ascertained that the total investment in the transmission system was $6,762,000, leaving $9,488,000 as the total distribution investment. The uniform classification of accounts gives the distribution system investment as charged to substation equipment, underground and overhead construction, transformers and services. The company engineers were requested to study their numbered and listed circuits as shown on the circuit maps and estimate the cost of each of these *in toto,* in underground and overhead proportions, and in terms of the classes of service handled.

In the typical circuit for which the field sheet tabulation for use of the company's engineering department is shown the transformers and services connected to the circuit are divided according to the class of service supplied by each unit installed. The demands of each class of business supplied by the circuit are measured or estimated as best may be by the engineers of the operating company familiar with those circuits and the percentage of line usage by each class of business.

The investments in underground facilities, overhead line equipment, services and transformers are tabulated under the uniform classification of accounts numbers corresponding to each and the totals correspond to the values of the items making up the circuit. These account number totals are then split into residential, commercial and industrial items which make up the total of each account number. The grand total of all items equals the value of the circuit as obtained by the engineering department.

In other words, the accounts were built by engineers from the bottom up and not by accountants subdividing the total account figure.

Thus, the investment value of the typical circuit No. 2029-Wh was $19,657, divided as shown between overhead and underground. There were 51 transformers, valued at $3,951 installed, of which eight, aggregating 68 kva., served residential customers. The combined residential transformer rating represented 16 per cent of the group and the proportional value of the residential transformers was $612. Likewise, the number of residential services on the circuit totaled 145, the value of these being $981, as overhead services.

The company engineers estimated that the residential usage of the circuit amounted to 7 per cent of the total usage. The total of the four overhead and underground account classifications Nos. 330, 331, 332 and 333 was $13,697. The 7 per cent usage chargeable to residential customers totaled $978. The company engineers, through their familiarity with the demands and use of the circuit and the work orders, then split this total of $978 into the account classification numbers, giving the respective items $304, $287, $299 and $88 for the resulting segregation of the residential investment.

The final portion of the circuit investment chargeable to residence service is the sum of the items listed under the several account numbers, amounting in the typical case to $2,571.

From the itemization of individual circuits are built up the total investments applicable to each class of business throughout the distribution system. The same principles are applied to determine the cost chargeable to each class of business for substations, transmission system and generating plant investment. The proportion of transmission and generating plant investment due to residence service is obtained by the ratio of the residence individual class demand to the total non-coincident demand. Operating costs can also be determined with due weight to expenses dependent on demand, energy used and customers supplied.

An example of how all these classified and segregated items appear in a tabulation of the investment required by the residential class of business is given in the accompanying table.

Summary of Investment Required by Residential Business

Steam and hydro plant, including land and structures	$2,729,000
Transmission system, including land, structures, overhead and underground lines	1,031,300
Distribution, including land, structures, underground, overhead lines and transformers	2,818,800
Miscellaneous, general and office equipment, including stores, transportation equipment, materials and supplies	581,200
Meters and customer investment, including services, meters, land and structures for general offices, stores and transportation	2,406,200
Total	$9,566,589

These items include investment in unfinished construction, but not working capital or intangible capital, which are detailed separately in the actual analysis.

Examples of method's accuracy

A few examples from a cost analysis are given to show the accuracy which this class of work is attaining in cases where conscientious co-operation takes place between company engineers and consultants. It must be remembered that in a comparatively rapid appraisal of the lines 100 per cent accuracy to the charges in the uniform classification of accounts cannot be expected and is not really feasible. But in one case the engineers of the operating company computed a total of $2,173,000 as the investment in underground distribution system construction, against the classification of accounts actual investment of $2,344,000. On the same basis the company brought in $3,517,000 and the accounts showed $3,724,000 for the overhead distribution system; for services rendered to customers the investment computed by the company was $777,000 and by the accounts $800,000.

An agreement to 84.36 per cent on total distribution investment was reached in another cost analysis summarized below for the distribution system of an operating company whose engineers worked with the field sheets for nearly three months prior to the arrival of the consultants from an investigation in another part of the country. Collusion was out of the question, and the results reveal a gratifying degree of accuracy as a basis for cost analysis whether for rate basing, the design of promotional rates or other purposes:

Item	Book Value	Engineering Survey	Ratio
District and customers' substations	$820,951	$752,301	91.6
Underground lines	558,275	551,291	98.7
Overhead lines	2,799,281	2,215,154	79.1
Services	196,337	176,703	90
Line transformers	688,397	576,006	83.6
	$5,063,241	$4,271,455	84.36

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New Standards for Industrial Flashlight Performance

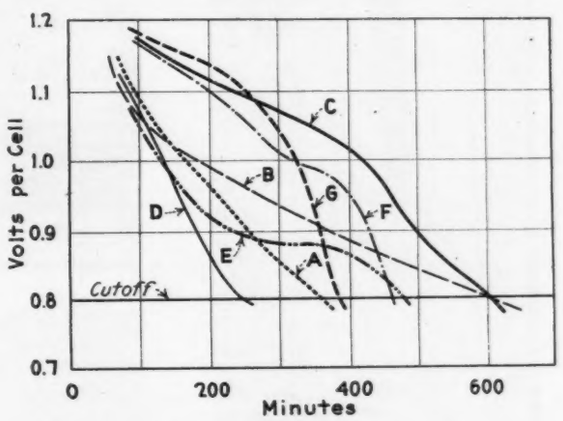
Recent developments insuring superior dry battery manufacture and the adoption of standard test procedures for these batteries promise decided advantages to producers, distributors and users of industrial flashlights. A conference on testing of industrial flashlight batteries held under the auspices of the Bureau of Standards and the American Standards Association sectional committee concerned was attended by practically all important battery makers and a considerable number of big users of industrial flashlights, such as public utility companies, telephone and telegraph companies and railroads.

Substantially unanimous agreement was reached by this group as to the types of performance expected and the tests which should be established to guide purchasers and insure good battery quality.

Two types of industrial service can be defined. "Heavy industrial service" is characterized by a battery life in regular daily use extending over five days or less. Meter reading in metropolitan areas or in commercial parts of smaller communities typically involves such heavy service. "Light industrial service" is characterized by a battery life of a week or more, ranging in many instances up to several months. It includes such applications as meter reading in residential districts or in the more scattered service areas of towns and cities, "trouble shooting" about works or in the distribution system, or that occasional industrial use of the flashlight typical of many plants.

Two tests are recommended, each appropriate to the class of service expected. The heavy service test consists simply of discharging the sample battery through a resistance coil of 4 ohms per cell for a four-minute period out of each fifteen minutes during the total of eight hours per day. The test is completed when the voltage of the cell is 0.8 at the end of such four-minute test period. Since good quality flashlight batteries for heavy industrial service will have a useful life of from 400 to 600 service-minutes, this test, involving closure of 128 minutes per day, will ordinarily be completed in four to five days. The light service test discharges the sample battery through 4 ohms per cell for four minutes each hour, eight hours per day, to the same terminal voltage. Thus the test includes 32 minutes of discharge per day, and for a first-class cell will extend to approximately three weeks.

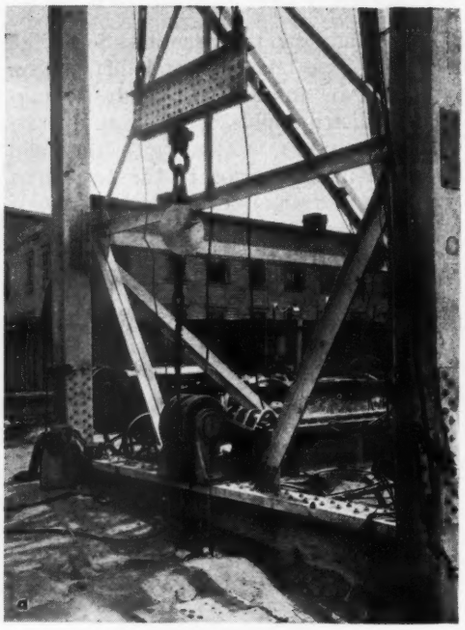
Purchasers of industrial flashlight batteries secure guarantees from all important makers as to the performance of their product under these tentative standard test conditions. It is important that large purchases of flashlight batteries be made with the understanding as to which type of service is intended, since the larger manufacturers make two corresponding types of cell for industrial service.

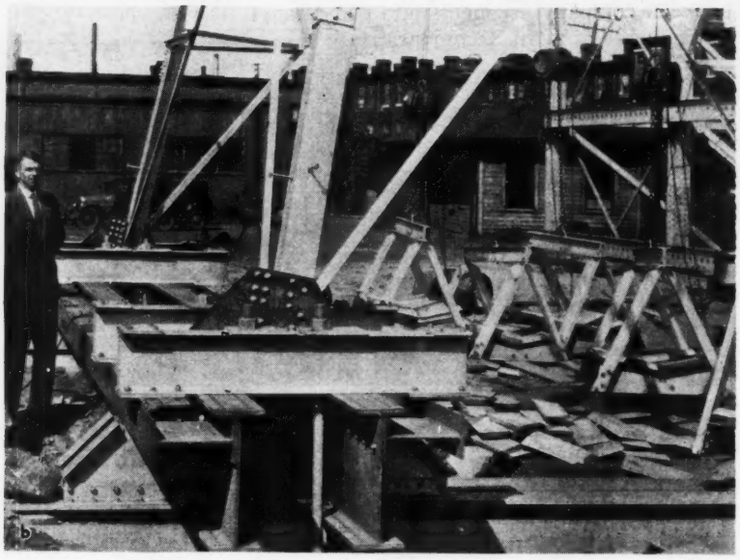


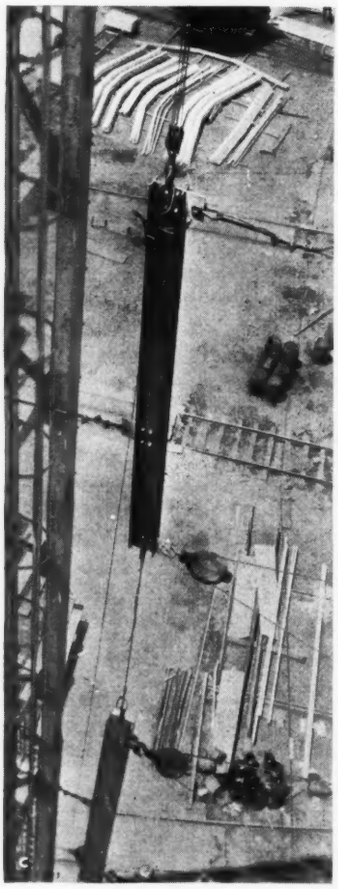
Commercial flashlight cells should have 400 to 600 minutes life

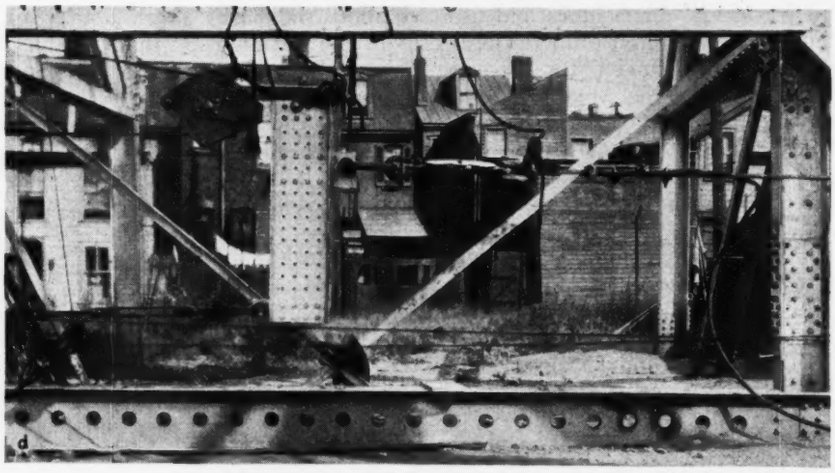
Seven makes of cells tested for Bureau of Standards conference show varying service life.

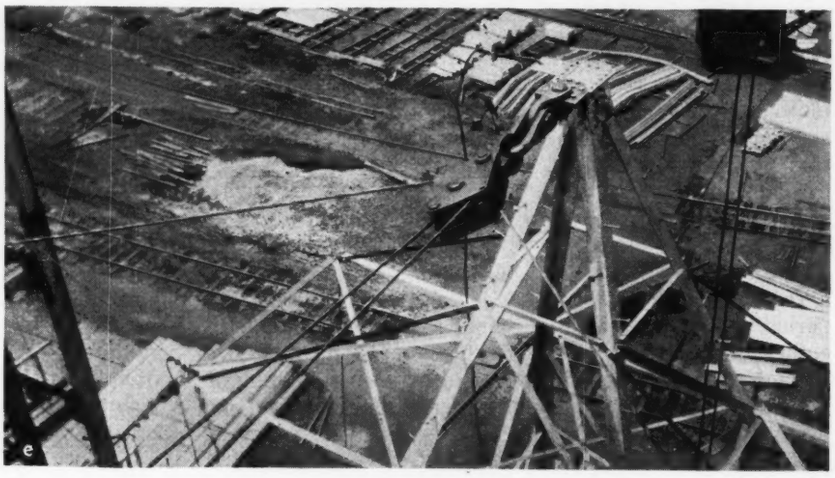
Test Frame for Towers











(Application of these elements is shown on the opposite page.)

(a) Doubletree and dynamometer for transverse loads.

(b) Attachment of tower to fixed grillage showing pans for vertical leads in background.

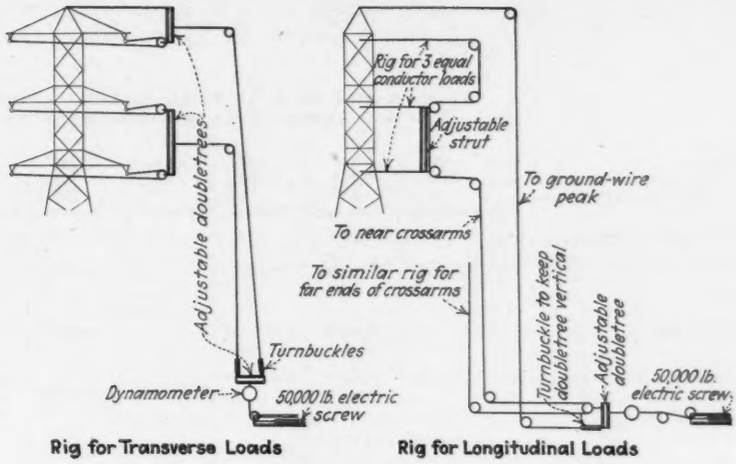
(c) Doubletrees for transverse rig.

(d) Doubletree and dynamometer for longitudinal leads.

(e) Peak rig for concentrated load.

Establishes Service Values

By N. B. OBBARD
Tower Department,
American Bridge Company, Pittsburgh, Pa.



Test loads may be applied to closely simulate service conditions

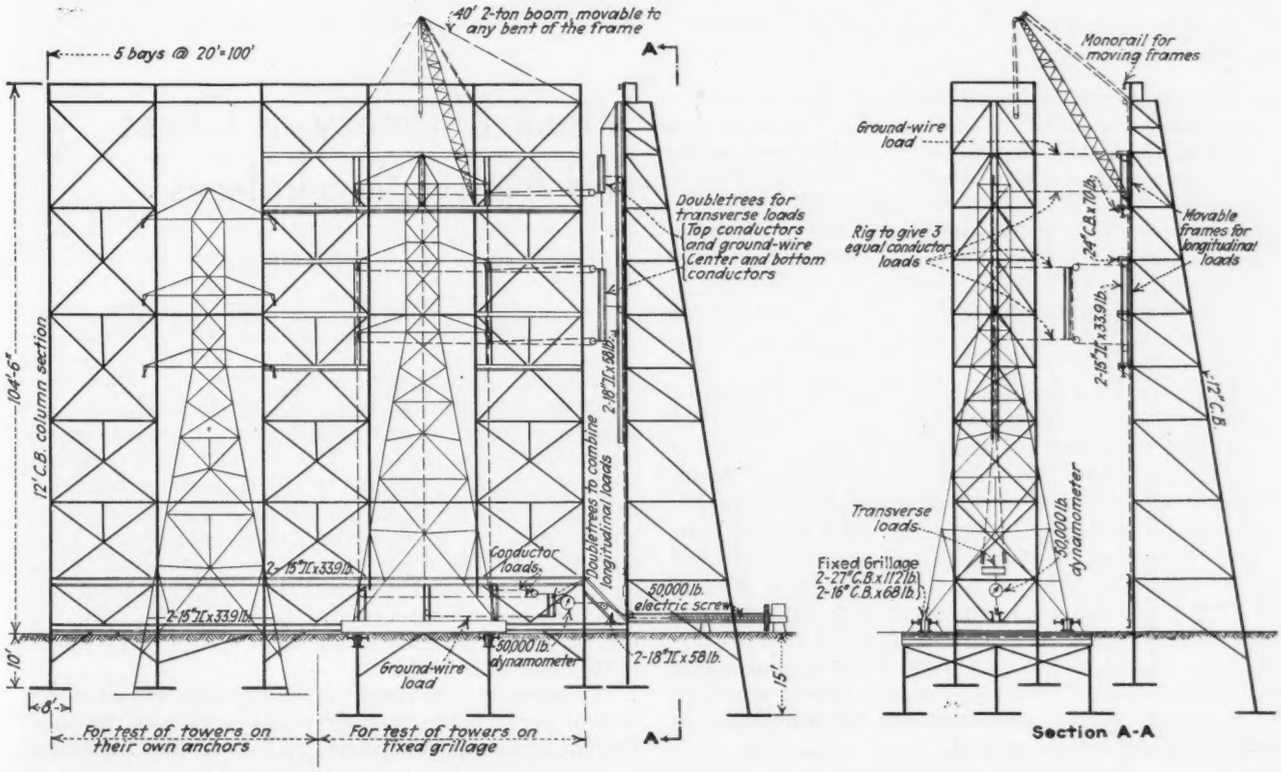
DUE to the large duplication of units for a line of transmission towers it is important that the design be made to fine limits and that the details be as economical and convenient as possible. The behavior of standard types of towers under load can be closely predicted, but from time to time new designs are developed which can only be satisfactorily investigated by means of full-size tests.

To meet the need of full-size testing of towers the American Bridge Company has recently built a new test frame at its Shiffler tower plant in Pittsburgh. This frame takes the place of an old structure which was built in 1912 and which had grown too small for modern transmission towers.

Towers up to 100 ft. in height may be tested here either on a fixed grillage or upon their own earth anchors. The frame is built throughout of galvanized, bolted steel with earth grillage anchors. The greatest load which has so far been applied by means of it is a concentrated pull of 110,600 lb. 85 ft. above grade. This gave a reaction of 247,300 lb. per leg on the fixed grillage with a maximum movement of $\frac{1}{4}$ in.

The loads on an ordinary double circuit tower under test must be suitably divided between seven points. The development of a simple and reliable pulling rig has therefore been a matter of importance. The transverse and longitudinal loads are distributed through adjustable doubletrees, with reduction rigging if necessary, and brought down to two 50,000 lb. dynamometers which

Towers up to 100 ft. high may be fully tested with this frame



Electric Steam Boiler

As reported by N. D. Paine, electrical apparatus committee, Canadian Electrical Association, at the recent annual meeting of that organization

Voltage	550	550	575	2,200	2,200	2,300	2,200	2,200	2,300	2,400	2,200
Rating, kw	500	2,000	1,500	600	800	750	3,750	5,000	5,000	5,000	8,000
Pressure lbs. sq.in	40	160	70	75	200	120	160	240	240	210	200
Control	Automatic	Manual	Manual	Manual	Manual	Automatic	Manual	Manual or Automatic	Manual	Manual	Manual
Av. operating efficiency	98%	90%	.....	.....	.....	.....	95%	98%	97% approx.	91%	95%
Life of electrodes	3 years	5 years	3 years	.....	9 months	3 months	1-2 years	Very little wear in 40,000,000 kwh	Good condition after 3 years	1 year	4 years
Life of bushings	5 years or more	2 years	6 months 2 years	.....	2 years	1 year	9 years	2 sets changed in 6 years	9 months	1 year	2 years
Life of groundplates and heads	Indefinite	5 years	Indefinite	.....	No replacement in 2½ years	Still good after 7 years	No renewals in 9 years	Very little wear	Indefinite	8 years	2 years
Number of tanks	1	1	1	1	1	1	1	1	1	1	1
Dryness of steam	Not tested	Not tested	97% approx.	.....	.....	Fair	96%	Approx. 96%	.....	95%	99%
Hydrogen excessive	No	No evidence	No	No	.....	No	No	No	No	No	No
Quality boiler feedwater	100% condensate	30% condensate	90% condensate	Fair	River water	Fair	Unfiltered river water	Fair	Soft, no scale	From accumulator	Excellent
Percentage bleed	None	Indefinite	.....	.....	Slight continuous	Very little	3% hourly	10%	None	Very small	Practically none at full load
How often are boilers blown down	Daily	Every eight hours	Once daily	Weekly	Once daily	Twice daily	Shut down for cleaning every 5 or 6 weeks	Operation intermittent	Weekly	Every four hours	Once daily
Difficult to balance load in each phase	No	No	No	No	No	No	No	No	No	No	No
Max. satisfactory load	800 kw.	125%	1,500 kw.	100%	100%	1,000 kw	100%	5,000 kw.	7,000 kw.	7,000 kw.	150%
Min. satisfactory load	50 kw.	50%	500 kw.	25%	20%	200 kw.	20%	500 kw.	500 kw.	1,500 kw.	20%
Type of relay protection	Overload	I.T.L. overload	Overload and under voltage	PQ-CGE	Overload	Overload no voltage	Overload and potential balance	Low voltage	Overload and ground	Inst. overload undervoltage	Overload
Reliability	Good	Satisfactory	Good	Good	Good	Very good	Very good	.....	100%	Good	Good
Maintenance costs	.....	Not available	Very low	.....	.....	$0.08 per 1,000 kw.-hr.	1.4c. per 1,000 pounds of steam	Negligible	$0.01016 per 1,000 kw.-hr.	$0.005 per 1,000 kw.-hr.	$0.0135 per 1,000 kw.-hr.
Remarks	Boiler opened once a year for cleaning and inspection	These units are used to improve load factor of power house	.....	Boiler used only on Sundays during winter	Two boilers used for heating only at 25-35 pds.	Operated on surplus power. Maintenance includes cleaning boiler once a month. Results very satisfactory	.....	Operated intermittently according to water conditions	.....	.....	.....

are close together and may be read from a central observation point. The load is applied by means of two 50,000-lb. electrically driven mechanical screws, operated from a central control station. These screws give a smoothly applied, easily controlled load which has proved to be very satisfactory for testing purposes. Vertical test loads, which are comparatively small, are applied by means of scale pans and 60-lb. spelter blocks. A 2-ton 40-ft. gasoline-driven boom is used for making changes in rig and erecting towers. It is shown in the drawing on page 471.

When towers are tested on a fixed grillage foundation a structural shoe is built up to fit the tower stub. The legs subject to uplift are anchored down by means of 2¼-in. anchor bolts. The 27-in. 112-lb. Carnegie beams used in the anchorage represent some of the heaviest work which has been galvanized up to the present time.

The frame was completed in the spring of 1930 and has proved to be highly satisfactory. Using a gang of five men it is possible to erect, rig, test and dismantle small towers in four working days. Six test pulls, involving three changes of rig, with intermediate readings, have been made in three hours. This new frame expedites the testing of towers and increases the knowledge at present available on the subject.

Visual Efficiency in Quiet and Noisy Workplaces

By M. LUCKIESH

Director Lighting Research Laboratory, General Electric Company, Cleveland, Ohio

Scientific investigations which seek to establish relationships between lighting and work production are usually controlled so as to minimize the effect of disturbing and irrelevant factors. The results of such researches are more closely applicable to ideal working conditions than they are to those commonly encountered in the work-world. It is recognized that noise exerts a deleterious influence upon the nervous system and it can be shown that it also influences the efficiency of working. The increased attention that is being given to noise prevention is an indication of the importance of this subject to the industrial world.

We recently conducted an experiment in which the rate of performing exacting visual work was measured for two different conditions: (1) In a quiet room and

Performances Compared

Voltage	2,200	2,200	3,600	4,400	4,400	6,600	6,600	6,600	6,600	6,600	13,200
Rating, kw.-hr.	10,000	12,000	5,000	7,500	24,000	10,000	15,00	25,000	28,000	42,000	32,000
Pressure, pounds	160	127	125	225	150	200	2000	125	150	200	150
Control	Manual	Manual	Automatic	Manual	Manual	Manual	Manual	Manual	Manual	Manual	Manual
Av. operating efficiency	95.2%	92%	97%	97%	94%	98.5%	97.9%	96%	92%	97%	92%
Life of electrodes		1 year	W.I. 8 months C.I. 2 years	10,000,000 kw.-hr.	Rods 8 weeks Cast 1-2 years	3-4 years	108-12 months	2-4 years	160,000,000 kw.-hr.	Tip 2 years Base 1 year	6 months
Life of bushings		6-8 months	2 years	6 months		7-10 months	4-5 months	8-10 months	6 months	Inner 4 months outer 18 months	1-2 years
Life of ground plates and heads		Originals still in service	5 years or more		4 years No wear	No experience to date	Originals still in service	5 years head indef.	5 years	Gr. plates 3 years, heads over 4 years	No replacement in 5 years
Number of tanks	1	3	1	1	3	1	3	3	3	3	3
Dryness of steam		92%	96%	98%	98%	96%	98%	99%	98%	97%	97%
Hydrogen excessive	No	No	No	No	No	Apparently not	No	No	No	See remarks	No
Quality boiler feed-water	Good	Good	25% condensate	Good	Good	90% condensate	Good	River water	Good 60% condensate	Good 50% condensate	Good
Percentage bleed	None	Bleeding small % continuously	1-10%		3-4%		2%	Varies with load	1-2% full load 30-40% light load	0-18%	1-6% continuous
How often are boilers blown down	Every four hours	Twice per week	3 times daily	Every half hour	Weekly	Every eight hours	Every eight hours	Every two weeks	Three times daily	1 foot in each tank every four hours	Every six weeks
Difficult to balance load in each phase		No	No	No, depends on condition of electrodes	No	No	No	No	No	No	No
Max. satisfactory load	10,000 kw.	14,000 kw.	6,000 kw.	8,000 kw.	28,000 kw.	12,500 kw.	20,000 kw.	25,000 kw.	28,000 kw.	42,000 kw.	36,000 kw.
Min. satisfactory load	1,000 kw.	4,500 kw.	1,000 kw.	1,500 kw.	3,000 kw.	1,500 kw.	5,000 kw.	6,000 kw.	4,000 kw.	10,000 kw.	16,000 kw.
Type of relay protection	Overload and ground	Unbalance and overload	Overload and ground	Overload	Overload	Inst. & time overload low voltage	Overload ground and unbalance	Overload and potential bal.	Overload and low voltage	Overload	Overload and ground
Reliability	Good	Good	Good	Good		O.K.	Good	Practically 100%	Good	Good	Very good
Maintenance costs	$0.0022 per 1,000 lb. steam			0.002-008 cent per kw.-hr.	$1.40 per million kw.-hr.	$0.00622 per 1,000 kw.-hr.	0.00217 ct. per kw.-hr.	$350 per Year	1.75 cents per 1,000 lb.	0.016 cent per 1,000 lb.	$0.0057 per 1,000 lb.
Remarks	Steam	Two boilers each 12,000 kva. used intermittently during night on dump power. Sundays and holidays on contract power		Baffles prevent current concentration at tip of electrodes and increase life of electrodes	Outage on 3 Boilers for 1930, 2 hours 14 minutes		Above figures based on normal rating bushings recently redesigned and operation improved	Two boilers of this rating	Low efficiency due to week end operation at very light load. Elec. boilers take all load variation. Sodium carbonate put in feed-water when starting a cold boiler	Hydrogen excessive if all fresh make-up water used. If all condensate used for feedwater no bleeding required and amount of gas generated is nil.	Low efficiency due to losses in accumulator and to week end operation at very light loads

(2) in a room in which several 10-kw. motor-generator sets were operated. The visual work was done in a booth and at a level of illumination of 5 foot-candles in both situations. Hence the distracting noise of the machines is the only known variable in the experiment. Our demonstration visual test was used as a measuring device for determining the speed with which visual work could be accomplished. Nine subjects participated in the experiment and each subject performed the test ten consecutive times on each of four different days for each condition.

In summarizing the results obtained a correction was applied to counterbalance the progressive decrease in the time required to perform the test, which occurred as the subjects became familiar with the test. The results are presented herewith.

Condition	Minutes for Test
In quiet room	0.77
In generator room	0.82

These results indicate that the distracting noise of the machines increased the average time required for the test by about 6 per cent. This difference is more than six times the probable error of the measurements and hence it may be regarded as a significant difference. It is probable that a greater difference could be obtained if the experiment were conducted in a factory where the distracting noises were of a non-rhythmic character.

It is obvious that the influence of moving objects would be much more pronounced if they were within the view as well as within the hearing of the workers. It is recognized that the test period is short in comparison with the entire workday and that the results presented are not necessarily representative of the effect of continuous work amid distracting influences.

These data are additional evidence that conclusions drawn from the usual laboratory researches are conservative when applied to situations in the work-world. This is particularly true when test data are used as a criterion for determining the level of illumination that will permit the economic maximum in work-production.

Since much of the distracting noise of the factory and office is unpreventable, the worker should not be subjected to the unnecessary annoyance of inadequate lighting.

READERS' FORUM

Cites Operating Experience to Support Previous Comments

To the Editor of the ELECTRICAL WORLD:

J. N. Mahoney, in a letter entitled "Using D.C. Experience in A.C. Circuit-Breaker Design," in the July 11 issue of the ELECTRICAL WORLD, says in part:

> It is believed "the mechanical arrangements" [quoting from an ELECTRICAL WORLD editorial on "Oil Circuit Breaker Theory" in the February 7 issue] have not been given the consideration possible in most oil circuit-breaker designs, particularly with reference to the relative speed of contact movement to circuit voltage and characteristics, the proper control of and rate of acceleration and deceleration of the moving contact elements, and a mechanical design that will carry out the intent of the designer under installation and operating conditions with a moderate inspection and maintenance expense.

The writer's experience during the past five years in maintaining and rebuilding high-voltage oil circuit breakers has substantiated these ideas and shown them to be of far more value to the operator than the more theoretical information from our switch developers.

A study of switch-operating performances on line positions with interrupting capacities up to 1,000,000 kva. has developed a keener appreciation of the part played by the operating mechanism. As an example of this tendency the writer has in mind one station where switches were stressed to their limit owing to short circuits on 33,000-volt cables. A few alterations in these switches provided better arc contacts, a greater arc gap and a greater speed of break, with the result that all subsequent interruptions have shown but slight switch stress due to shorter switch arcs.

A need for the study of switch-blade velocity at all points over the opening or closing strokes has led to the use of a tuning fork with a stylus for the recording of velocity curves. A study of many switches with this instrument has shown that the prevalent idea of "erratic arc stresses" could properly be changed to "erratic switch operation." Switches that are slow because of misalignment or improper adjustments, dashpots that checked the opening stroke too soon or not at all and other imperfections were shown to be prevalent, owing to lack of testing facilities available to construction and maintenance men. The need of many fundamental factory changes has also been shown by this study.

After numerous makes and types of switches had been analyzed for speeds of operation, it was found that the oscillographic records of system short circuits indicated that the switches with the faster arc-break velocity experienced less arcing.

More than 400 switches have been rebuilt with improvements intended to increase interrupting capability and decrease inspection and maintenance expenses. Arcing time and over-all system disturbance time have been cut down as mechanical improvements have been made. In many of the switches with multi-break contacts the arc-break velocity at time of arc-contact parting is 40 ft. to 50 ft. per second and the maximum arc-break velocity is 80 ft. to 100 ft. per second. A velocity of 55 ft. per second on a 33,000-volt system would meet the speed required in Mr. Mahoney's formula:

> The speed should be such that contact separation equal to one inch of break in oil for each 5,000 line volts is made in the time of one-half cycle at 60 cycles, or somewhat less. This assumes a clear break distance in oil and that the arc will be broken at approximately one-half travel and therefore within the first full cycle at 60 cycles.

Dozens of oscillograms recording switch action during system short circuits have shown that the switch arc will be extinguished within the first cycle of arcing with the speeds suggested.

These higher arcing speeds have been obtained through the use of lighter and simpler moving mechanisms, balanced spring energy for opening acceleration, decelerating dashpots and changes to multi-break contact systems. The improvements have been made to eliminate all weaknesses and to assure a uniform high-speed switch operation for an indefinite time irrespective of the operating duty.

It is believed that greater attention to the mechanical system will improve the performance of many old switches, saving them from obsolescence. Faster-operating mechanisms are needed in new switches to reduce both system disturbances and switch stresses.

ROBERT E. ROWLEY,
Junior Electrical Engineer.
Municipal Department of Water and Power,
City of Los Angeles.

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Lamp Voltage Conclusions Challenged

To the Editor of the ELECTRICAL WORLD:

In the August 15 issue of the ELECTRICAL WORLD an editorial appears headed "Standardizing on 115 Volts." I do not believe the facts justify this editorial. I have always been opposed to standardizing on 115 volts, since 120-volt standardization gives better service conditions and considerable saving in cost. Regulation is of paramount importance in the main system, and fluctuations in voltage are nearly 10 per cent less with 120 volts as compared with 115 volts.

The 1931 report of the lamp committee of the National Electric Light Association is available, and I would call to your attention the figures given in Table III and the diagram shown in Fig. 3. You will note that the percentage of the number of lamps distributed in the 115-volt class was lower by 0.6 per cent in 1930 than it was in 1929, whereas the percentage in the 120-volt class was raised 1.9 per cent. In 1930 the number of lamps distributed in the 120-volt class was nearly as large as the number of lamps distributed in the 115-volt class, and with the extensions of the network system throughout the country, which show very material advantages for the 120-volt classification, I believe we shall find that within a very few years the 120-volt uses will far outclass the 115-volt uses.

HARRY R. WOODROW,
Electrical Engineer.
Brooklyn Edison Company,
Brooklyn, N. Y.

Men of the Industry

O. H. Simonds Heads Gas Company

O. H. SIMONDS, for the past eight years conected with the Electric Bond & Share Company, has been elected president of the Appalachian Gas Corporation. In recent years Mr. Simonds has served as sponsor for the Arkansas Power & Light Company, the Mississippi Power & Light Company and the Louisiana Power & Light Company and was also a director of these three companies, which are under the supervision of the Electric Bond & Share Company. Mr. Simonds was born in Duluth, Minn., and was graduated from Cornell University. After spending some time in the employ of the General Electric Company he became general manager of the Vicksburg (Miss.) Light & Traction Company, in 1915. Later he was made vice-president and general manager of the Dubuque (Iowa) Electric Company. It was from this executive position that he resigned in 1923 to ally himself with the Electric Bond & Share Company. In the course of his career Mr. Simonds has devoted considerable time to association activities and to committee work for the National Electric Light Association.

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A. J. TROLLMAN, formerly connected with the Flint office of the Consumers Power Company, is now affiliated with the engineering department of that company's Grand Rapids office.

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A. J. BOULDING of the C. A. Parsons Manufacturing Company of England was recently transferred to Moose Jaw, Saskatchewan, where the company has established its headquarters for western Canada. The company manufactures steam turbines.

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D. J. NIEMEYER, formerly manager at Shelbyville, Ky., for the Kentucky Utilities Company, recently became district manager for the company at Lebanon, to succeed C. B. Hanna, now central division manager.

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R. H. LUSSKY, Oklahoma City, has resigned as gas and electric engineer of the Oklahoma Corporation Commission to accept private employment. JOHN J. HASSLER, formerly city manager of Elk City, has been appointed to the position to succeed Mr. Lussky. Mr. Hassler is an engineering graduate of the Oklahoma Agricultural and Mechanical College and is experienced in rate matters. Mr. Lussky has been gas and electric engineer of the Corporation Commission for several years and has had wide experience as a gas engineer and utility executive.

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R. A. Sharon Assumes New Duties

R. A. SHARON has been named sponsor of the Arkansas Power & Light Company, the Mississippi Power & Light Company and the Louisiana Power & Light Company, properties of the Electric Bond & Share Company, to succeed

O. H. Simonds, who is now president of the Appalachian Gas Company.

Mr. Sharon joined the Electric Bond & Share organization last November, having previously been assistant to the vice-president and general manager of the Great Western Power Company of California with headquarters in San Francisco. Mr. Sharon entered the electrical industry as an enployee of the City Electric Company, San Francisco, following graduation from Yale University in 1912. Later he became identied with the Standard Oil Company and engaged in sales work for that organization in California and the Northwest. Early in 1925 he affiliated himself with the Great Western Power Company in the capacity of assistant sales manager, having charge of industrial power sales and public relations. Two years later he was appointed assistant to the vice-president and general manager. His connection with the Electric Bond & Share Company followed last year, with headquarters in New York.

Johns-Manville Elects Vice-Presidents

AT THE LAST MEETING of the board of directors of the Johns-Manville Sales Corporation, T. K. Mial, R. C. Harden, G. R. Lewis, J. M. Taylor and Franklin Shuey were elected vice-presidents, to have executive supervision of various territorial districts. The districts for which these executives will be responsible are as follows: T. K. Mial, Metropolitan, Boston, Philadelphia and New York State; R. C. Harden, Chicago, St. Louis, Northwestern and Denver; G. R. Lewis, Cleveland, Detroit, Pittsburgh and Cincinnati; J. M. Taylor, New Orleans, Atlanta and Houston; Franklin Shuey, San Francisco, Los Angeles and Seattle.

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MATTHEW S. SLOAN, president of the New York Edison Company and affiliated companies, has been named a member of the committee of seventeen appointed by Walter S. Gifford, director of President Hoover's organization for unemployment relief. This committee will be responsible for developing the extension of emergency industrial policies which have been found practical in providing employment.

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OWEN D. YOUNG, chairman of the board of directors of the General Electric Company, has been appointed chairman of a committee for the mobilization of relief resources by Walter S. Gifford, director of President Hoover's organization on unemployment relief. As chairman of the new committee, Mr. Young will be responsible for the co-ordination of all local fund-raising campaigns, the administration of such funds and all activities concerned with the distribution and increase of employment.

•

GARDNER C. GEORGE of Albany has been appointed civil and mechanical engineer of the New York Power & Light Corporation. The appointment becomes effective immediately and Mr. George's headquarters will remain at Albany. Mr. George was formerly superintendent of drafting for New York Power & Light, having charge of the various drafting and blueprinting activities of the company. Previous to his connection with the New York Power organization on September 25, 1929, Mr. George was chief designing engineer of the Power Corporation of New York at Watertown, where he was located for seven years. He attended

Massachusetts Institute of Technology, graduating in 1911 with a degree of B.S. in civil engineering. Following his graduation, Mr. George spent two years as assistant engineer for the New York City Board of Water Supply, and a year in Mexico as designer on hydro-electric construction for the Mexican Northern Power Company.

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ARTHUR FREED has assumed the duties of president of the Easton Coil Company, Easton, Pa.

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W. C. COLEGROVE has entered the engineering department of the Consumers Power Company at Grand Rapids, Mich. Mr. Colgrove is a graduate of Michigan State College.

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W. C. JOHNSON, formerly connected with the Jackson office of the Consumers Power Company, has recently entered the engineering department of that company in the Grand Rapids office.

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RALF TOENSFELFT, formerly chief electrical engineer for the St. Louis (Mo.), Department of Public Utilities, has been appointed chief engineer of the Building Department of the St. Louis Board of Education, effective September 15.

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R. R. DAVIS has been appointed apparatus advertising manager of the Westinghouse Electric & Manufacturing Company at East Pittsburgh and will be in charge of all apparatus advertising except for the merchandising department.

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J. E. FLANDERS of Paris, Mo., has been appointed chief engineer of the Missouri State Public Service Commission to succeed F. M. Plake, resigned. A graduate of the Missouri School of Mines at Rolla, Mo., Mr. Flanders has been with the commission for ten years and for several years has been assistant chief engineer.

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J. S. NORRIS, vice-president and managing director of Montreal Light, Heat & Power Consolidated, has recently completed 3½ decades of service to the company and community. Starting life without advantage of inherited position or influence, Mr. Norris has steadily progressed to his present position of importance. He first joined the company in 1896, when he was appointed secretary to the president, Sir Herbert Holt. This position gave abundant opportunity for acquiring knowledge of company affairs, which resulted in 1906 in his appointment to the post of secretary-treasurer. Five years later he was appointed to the position of general manager. Then in 1917 he joined the board of directors and was elected to the office of vice-president. Two years ago he was named for the newly created office of managing director and at the same time was re-elected vice-president.

•

H. J. FLAGG, for the past seven years assistant to the general manager of the Grays Harbor Railway & Light Company, Aberdeen, Wash., has severed his connection with that company to take up a new position with the parent company, the Federal Light & Traction Company, New York. His primary task will be that of increasing the load on Federal Light & Traction properties.

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ROY A. PALMER, illuminating engineer for the Southern Public Utilities-North Carolina Public Service System, is at the present time abroad, where he is making a study of European lighting practices. The survey is being made under the direction of a committee made up of representatives of various lighting service bureaus in Europe. He attended the International Illumination Congress meeting in London last week, having been appointed to present to the congress the report of the international committee on applied lighting practices.

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DR. PHILIP G. WRIGHT has been appointed special statistician of the Federal Power Commission to assist in the study it is making of the ownership, control and affiliations of public utility operating companies which are licensed under the federal water-power act. Dr. Wright, who is a native of Boston, holds degrees from Tufts College and from Harvard University. In the course of his career he conducted courses in economics and finance and served as special expert on the staff of the United States Tariff Commission for several years. Dr. Wright has written extensively for the *Quarterly Journal of Economics*, *Journal* of the American Bankers' Association, *Review of Reviews* and the *Tariff Review*.

•

W. W. BARR, whose appointment to the position of director of the merchandising division of the Georgia Power Company was announced in the August 29 issue of the ELECTRICAL WORLD, has taken over the duties of his new office. He was formerly assistant to Charles A. Collier, vice-president in charge of sales. Mr. Barr, who is a native of Eufala, Ala., is a graduate of the United States Naval Academy at Annapolis. He joined the Georgia Power Company in 1922 as retail salesman and his advancement has been steady. At the present time he is one of the best-known merchandising men in the Southeast.

FRANK THORNTON, Jr., manager of residence engineering, general engineering department, Westinghouse Electric & Manufacturing Company, has been appointed manager of association activities of that company to succeed R. W. E. Moore, resigned. Mr. Thornton was graduated from the University of Missouri in 1908. He entered the employ of the Westinghouse Electric & Manufacturing Company and after completing the graduate student course he was sent to the engineering department, where he specialized in electric heating. When the electrical heating engineering department was organized he was appointed manager of it. Mr. Thornton is a fellow of the American Institute of Electrical Engineers.

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OBITUARY

JOSEPH W. BEAM, consulting electrical engineer, died August 21, of heart disease, at his home in Cleveland. Mr. Beam had directed his attention especially to illumination work. Previous to establishing a private practice he was connected with the engineering department of the Cleveland Electric Illuminating Company. Mr. Beam was 50 years of age.

•

J. R. BAKER, general auditor of the General Electric Company, died suddenly, August 17, at his home in East Orange, N. J., in his sixty-first year. Mr. Baker left St. Louis 25 years ago to become connected with the General Electric Company after that company had purchased the Columbia Incandescent Light Company of St. Louis, for which he had been auditor.

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CHOUTEAU E. PEARCE, engineer with Gilbert & Betelle, architects of Newark, N. J., died September 1, of heart disease, while inspecting work at the new building of the New Jersey State Teachers College near Trenton. Mr. Pearce was born in St. Louis and was graduated from the Stevens Institute of Technology. For many years he was engaged in electrical engineering. Mr. Pearce had been a resident of Elizabeth, N. J., for the past 35 years.

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E. FENTON GILBERT, president of the Dampney Company of America, Hyde Park, Mass., died suddenly, at his summer home on Cape Cod, as the result of a heart attack. Mr. Gilbert was well known in steam power plant engineering circles and was a native of Jamestown, N. Y. He was a graduate of the mechanical engineering course at Sheffield Scientific School, Yale University, in 1907. Mr. Gilbert was 45 years of age.

Financial and Statistical News

WHILE it is probably too early to say that Labor Day has this year failed to mark a turning point either in the markets or in business, as it so often did in the past, there are no major factors which point to a definite turn. Even signs of seasonal improvement are decidedly scarce.

——THE BOND MARKET HAS ESTABLISHED A NEW LOW, due largely to pressure on rail bonds. Stocks are close to a new low for the year. Utility averages have receded further; the ELECTRICAL WORLD index of common stocks has slid back to 57.7, against 60.2 a week ago and a low for the year of 56.7 the first of June.

——WHILE STOCKS OF ELECTRICAL MANUFACTURING COMPANIES have followed the market downward, more will be known of the real condition of the industry within a few days when Westinghouse, Western Electric, Electric Storage Battery and others have met to discuss their future dividend policies.

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Tri-Utilities Corporation May Be Reorganized

A COMMITTEE HAS BEEN APPOINTED to work out a reorganization of the Tri-Utilities Corporation, for which a receiver was appointed recently. It includes Richard C. Hunt, chairman; William Buchsbaum and Medley G. B. Whelpley. It is understood that a plan may be announced on or about September 15. The corporation omitted payment of the semi-annual interest due September 1 on its outstanding 5 per cent convertible debentures.

The reorganization plan was undertaken at the request of substantial creditors and stockholders of the corporation.

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British Electricity Generation Increases

RECEIPT OF ADVICES from London that the production of electricity by authorized sources in Great Britain during the month of July amounted to 785,000,000 kw.-hr., as compared with 786,000,000 kw.-hr. in July, 1930, a decrease of 0.1 per cent has been received by Utilities Power & Light Corporation. The amount of electricity generated in the first seven months of the year aggregated 6,415,000,000 kw.-hr., as compared with 6,207,000,000 kw.-hr. in the corresponding period of 1930, an increase of 3.4 per cent. The Utilities Power & Light System, which operates in a widely diversified territory here and abroad, now has the largest electricity area in the British Isles under one management.

The decrease of 0.1 per cent in Great Britain's July production compares with a decline of 1.2 per cent in the amount produced by the electric light & power industry of the United States during the same period. The seven months gain of 3.4 per cent in Great Britain compares with a 4.1 per cent decrease in the United States in the same interval.

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Electric Power & Light Revenues Up 31 per Cent

OPERATING REVENUES OF Electric Power & Light Corporation for the twelve months ended June 30 were $83,597,850, against $63,649,342 for the previous year, a gain of 31 per cent. Expenses, including taxes, totaled $40,623,326, against $32,164,505, leaving net operating revenue of $42,974,524, compared with $31,484,837, an increase of over 36 per cent. The balance after preferred dividends amounted to $21,347,493, against $16,815,909, and the balance applicable to Electric Power & Light Corporation was $13,071,939, against $10,751,910, an increase of over 21 per cent.

Assets of the corporation were $199,297,284 at June 30, compared with $174,350,555 a year previous.

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Condemn Calling Attention to Call Price of Bonds

REFERENCE was made recently in these columns to the practice on the part of certain utilities of calling attention of bondholders to the fact that existing bond prices were considerably above the call price. Objection to this practice by certain bond dealers is called to our attention by a reader who is a leader in the industry. He says:

"We have taken similar action a number of times within the past few years with respect to some of our issues which were selling above the call price and which were likely to be called. I regret to say, however, that our action did not get universal commendation. Many bond dealers thought we had no right to call attention to this possibility unless we actually accompanied the notice with a formal call. They professed to believe that we were giving such notice only in order to reduce the price so that we might buy the bonds more cheaply without calling the entire issue.

"Many insurance companies, corporate trustees and other institutional buyers severely criticise the calling of securities at all, claiming that it is an imposition to interfere with their portfolios unless the advantage to the calling company is so great as to be apparent to every one. Similarly, many of such buyers absolutely refuse to recognize the fact that redemption prices are put in indentures of bonds and preferred stocks for the benefit of the issuer and not in order to insure a profit to the purchaser. They, therefore, affect to see something immoral in the sale of the assets of a company and its subsequent liquidation with the payment to the holders of the preferred stock of only the liquidation value, as provided in the stock contract, instead of the call price.

"A number of preferred stocks of our operating companies show tendencies to sell at prices above their liquidation value, but any action pointing this out to holders is bitterly resented by security dealers active in the stocks as an

implied threat to take action toward the liquidation of such companies for the mere purpose of purchasing the stock at the voluntary liquidation prices or less instead of calling it at more or less punitive call price as high in some cases as 110 or 120.

Liquidation versus call price

"It seems to me that in these days of mergers, consolidations, sales, or other corporate rearrangements, any enterprise, no matter how large, is possibly subject to liquidation and that a great deal of subsequent bad public relations might be avoided if the fact could be brought firmly home to all holders of preferred stock that one of the essential conditions for that type of security is the possibility that it may be liquidated through sale of the assets or other similar action and that such action is often the only one that, in justice to their common-stock holders, the directors of such a corporation can take. Such an understanding would also effectively prevent the particularly offensive practice which is now continually carried on by certain security dealers who quietly canvass customer owners of preferred stock and offer them a small premium above their original purchase price, subsequently, when sizable blocks have been thus accumulated, reselling to institutions stocks that were never originally brought out with the exception that they would ultimately become a part of institutional portfolios. If institutional buyers should clearly realize that the liquidation value, rather than the call price, of such stocks is the true maximum to be kept in mind, there would obviously be no motive for them, in most cases, to purchase stocks originally put out for customer owners."

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Hartford Utility Declares Extra Dividends

ANNOUNCEMENT HAS BEEN MADE by the Hartford (Conn.) Electric Light Company of another customers', employees and extra dividend to stockholders payable in October. Employees of the company will receive 10 per cent of their October earnings, customers a 10 per cent reduction on their October bills and all stockholders an extra dividend of 10 per cent of the October accrual. The respective totals will amount to $14,000, $65,000 and $19,000. A letter to customers reads as follows:

Directors of the company are gratified that earnings of the company to date, in spite of unfavorable conditions, are sufficient to justify the payment of a 10 per cent customers' dividend on October bills instead of omitting it as seemed possible a few months ago.

In addition to the general slowness of business there are three unusual factors which have adversely affected our ability to declare a larger dividend this year.

The reduction in rates made last year has resulted in a decrease in our earnings and a saving to our customers of approximately $225,000.

In order to avoid laying off any employees we have anticipated a large amount of maintenance and construction work which normally would not have been done until next year. This, together with other efforts to do our share to relieve the unemployment situation, has resulted in unusual expenditures in excess of $200,000.

There has been a reduction in the volume of sales to other companies of $250,000.

The first two of the above items, while adversely affecting our earnings this year, will materially assist in increasing sales and decreasing expenses next year and should make possible the declaration of a larger dividend next year, such as has been possible in the past.

The most favorable factor and one which has had material influence on our ability to declare any dividend this year is the marked increase in the use of electricity in the home, and we take this opportunity to thank our customers for their co-operation in more and more doing electrically such work as can be done economically.

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July Earnings Pick Up

AFTER A SERIES OF MONTHS in which central-station revenue barely equaled or fell somewhat short of the corresponding income last year, July returns show an excess of 1.5 per cent compared with those a year ago. Although this is a preliminary figure, it is based on some 70 per cent of the aggregate operations throughout the country, all sections being well represented, and is not likely to be greatly changed when published in final form.

Compared with $167,200,000 in July, 1930, this indicates a new total of approximately $170,000,000, an increase of $2,300,000 over the preceding month. Last year the July revenue was somewhat smaller than that for June. The available information seems, therefore, to point to an appreciable upward turn for the month in question, at least. Further, while there are indications that August revenue data, when compiled, will also show an increase over 1930, details on this point cannot yet be developed.

The improvement was general. New England companies increased their revenue nearly 5 per cent over that of July last year, and returns covering 90 per cent of operations in the Middle Atlantic States show a rise exceeding 3 per cent. In the Central industrial area the earnings fell short of last year's about 2.5 per cent, against a considerably larger deficiency in other months; in most of the other regions the earnings were greater than last year.

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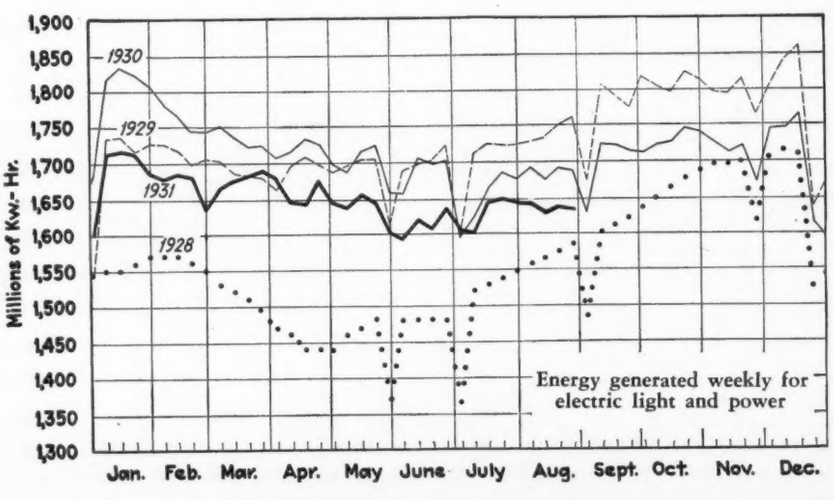
Little Change in Weekly Output

CENTRAL-STATION ENERGY output varied but slightly from week to week during August and the beginning of September, running on a level about 3 per cent lower than last year, according to the accompanying statistics published by the N.E.L.A.

	1931	1930	1929	1928
August 8	1,643	1,692	1,730	1,558
August 15	1,629	1,677	1,733	1,567
August 22	1,643	1,691	1,750	1,576
August 29	1,638	1,688	1,762	1,586
September 5	1,627	1,630	1,675	1,484

Because Labor Day followed the first Saturday in September this year but preceded it in the other years the figures for the week ended September 5 are not comparable with those in the earlier years.

Regionally comparisons for the last week in August show that on the Atlantic seaboard the output had increased 2.3 per cent over 1930; the central industrial region was down 6.5 per cent.



NEWS BRIEFS

Directors of Stone & Webster, Inc., have declared a dividend of 50 cents a share on the capital stock, payable October 15 to holders of record September 17. Distributions of 75 cents were made the last two quarters.

•

Pennsylvania Power & Light Company has called for redemption October 1 all its first and refunding mortgage 5 per cent bonds, series B, due in 1952, at 104 and interest. Prior to that time the company will redeem all bonds presented at 104 less a discount of 2 per cent from the date of presentation to October 1.

•

New York Stock Exchange has authorized the listing of additional 30 year first lien stamped 5 per cent sinking fund gold bonds of the Federal Light & Traction Comany, amounting to $1,646,000, series due March 1, 1942, on official notice of sale and issuance and distribution to the public. There have also been authorized for listing on the New York Stock Exchange 14,000 additional shares of common stock (no-par value) of the Weston Electrical Instrument Corporation on official notice of issuance in connection with the acquisition of the business and assets of Jewell Electrical Instrument Company, making the total amount applied for 164,000 shares of common stock.

•

Holders of the 8 per cent cumulative preferred stock and 7 per cent cumulative preferred stock of the Eastern New Jersey Power Company have been notified that the company will redeem October 1, all its outstanding stock of both classes at the redemption price of $115 per share and all accrued and unpaid dividends to that date. The assets of this company have recently been acquired by the Jersey Central Power & Light Company.

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Boosts Rural Sales 14 Per Cent

ILLUSTRATING THE GREAT possibilities for electrical development existing in rural territories, Utilities Power & Light Corporation reports an increase of 14.1 per cent in kilowatt-hour sales of electric energy to rural customers of its American properties for the year ended June 30, 1931, over the previous twelve months.

While part of this increase came from a gain of 4.8 per cent in number of rural customers served, the increase for the most part was due to greater use of electrical energy by farmers already being served. This is further indicated by the fact that the revenue received per rural customers showed an increase of 6.5 per cent for the year, while there was at the same time a reduction in rural rates amounting to 2.2 per cent in the aggregate.

Utilities Power & Light Corporation through its subsidiaries has consistently followed the policy of developing rural business wherever possible.

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Standard Gas Earnings Down Slightly

CONSOLIDATED EARNINGS of the Standard Gas & Electric Company and its subsidiary and affiliated companies for the twelve months ended June 30, 1931, show a balance of $11,148,594 after all charges including retirement reserve and preferred dividends, compared with a balance for the twelve months ended March 31, 1931, of $12,250,867, according to John J. O'Brien, president of the company.

The balance of $11,148,594 is equivalent to $5.15 a share on the 2,162,607 shares of common stock outstanding June 30, 1931, and compares with a balance equivalent to $5.66 a share on the 2,162,607 shares of common stock outstanding March 31, 1931. Gross earnings for the year ended June 30 from public utilities were $150,613,044.

Switzerland, 685 Kw.-Hr. per Capita

SWITZERLAND IS ONE of the leading countries of the world in electrical energy consumption per capita, the ratio having increased from 390 kw.-hr. annually in 1919 to 685 kw.-hr. in 1929, not counting that portion of the energy generated within the country which is exported. If the latter is included the figure for 1929 rises to 930 kw.-hr. per capita.

Central stations had an installed rating of 992,075 kw. Adding private plants for railway and industrial operations gives the country a total of 1,361,975 kw., all but 5 per cent driven by water power.

From the recently published official report covering public utility operations in 1929 the statistics in the accompanying table have been abstracted. For comparison corresponding data are given also, in certain instances, for other years.

In comparing the figures here given with those appearing in the ELECTRICAL WORLD of August 29, on page 389, the difference in scope of the two sets of statistics should be observed. The summary previously given for 1930 relates to all electric power plants, not only central stations but also those of the Federal Railways and for industrial purposes, whereas the following data are for central stations alone.

Swiss Power Industry

	1925	1929
Large primary establishments[1]		
Number	101	105
Generating stations	187	191
Hydraulic, kw	796,200	920,000
Thermal, kw	61,700	60,000
Small Primary Establishments[2]		
Number	203	168
Generating stations	213	175
Hydraulic, kw	11,600	10,550
Thermal, kw	1,720	1,525
Total central station kw.	861,220	992,075
Isolated Plants Other than Central Station[3]		
Number of enterprises	31	28
Power plants	60	62
Hydraulic, kw	305,500	364,500
Thermal, kw	5,350	5,400
Large Secondary Establishments[4]		
Number	55	58
Available power (from outside sources), kw.	115,450	161,100
Small Secondary Establishments[5]		
Number	962	933
Available power, kw.	59,550	72,200
Output of large primary establishments, kw.-hr[6].	2,702,000,000	3,750,000,000
Output of small primary establishments (estimated), kw-hr.	20,000,000	20,000,000
Total output, kw.-hr.	2,722,000,000	3,770,000,000

DEFINITIONS

[1] Defined as establishments that generate energy and have a total rating (including purchased) of more than 500 kw., or that have a generator rating exceeding 300 kw.

[2] Establishments having installed generator rating of 300 kw. or less.

[3] Private establishments (including railway and industrial) having installed capacity exceeding 300 kw., not public utility plants for light and power. Excepting the part sold to distributing company the energy generated in these private industrial plants is not included in the statistics that follow.

[4] Establishments operating on purchased energy only, with more than 500 kw. rating.

[5] Establishments operating on purchased energy with rating of 500 kw. or less. The "available power" of secondary establishments (items 4 and 5) should not be added to that of primary stations, since it merely represents such portion of the latter that is used by establishments operating solely on purchased energy.

[6] Includes imports from Germany and energy from railway and industrial plants:

140,000,000 kw.-hr. in 1925
195,000,000 kw.-hr. in 1929

ALLOCATION OF OUTPUT

Energy output of light and power companies in 1929 was distributed approximately as follows, losses being included in the various categories: (for instance, actual export is officially reported as 990)

	Million Kw.-Hr.
General use, for light, power and heating in homes and industries	2,050
Railway use, not including output of plants of Swiss Federal Railway	230
Chemical, metallurgical and thermal electric industries, aside from energy generated in private industrial plants	450
Energy exported	1,040
	3,770

CAPITAL INVESTED IN MAJOR ESTABLISHMENTS

Capital in larger primary plants	
Maximum capacity, kw	1,030,000
Invested in power stations, francs	736,000,000
(*a*) Installed prior to 1917, kw	547,500
(*b*) Installed since 1917, kw	430,000
Plant investment (*a*), francs	359,165,000
Plant investment (*b*), francs	370,635,000
(One Swiss franc = about 19.3 cents)	
Transmission and distribution	
Major primary systems, francs	466,000,000
Major secondary systems, francs	55,910,000

CUSTOMERS

	Number
1922	940,700
1925	1,012,200
1929	1,311,000
	Kw.-Hr.
Use per capita, Excluding export 1922	405
1925	529
1929	685

Business News and Markets

National Electrical Code Has A.S.A. Approval

APPROVAL of the 1931 edition of the National Electrical Code by the American Standards Association has just been announced following the submittal of the code by the National Fire Protection Association, sponsor for the sectional committee in charge of the revision of the code under A.S.A. procedure. A first edition of 200,000 copies is being printed by the National Board of Fire Underwriters and copies will shortly be available through the board's offices in New York, Chicago and San Francisco, or from the headquarters of the American Standards Association, 29 West 39th Street, New York, N. Y.

While in general the majority of the changes in the code are of an editorial nature, the more important new material is contained in the following changes:

New definitions are given in Article I, for the terms appliance, general use switch, grounding conductor and isolating switch.

A new Section 207 states what has been considered good practice for mounting requirements.

Changes in Article IV, service and service equipment, permit under special permission buildings having a multiple occupancy to have more than one set of service conductors and in addition approve the use of new forms of multiple conductor service cables. Section 405 of this article contains one of the most important changes in the code which permits the utility meter to be placed ahead of the service switch and the service fuse under certain conditions, and a second change which applies when the first is in effect permits the use, with various safeguards, of branch circuit breakers in place of the main service switch.

A change in Section 505, armored cable, requires protection to insulation at the cut ends of the armor.

Changes in Section 508, electrical metallic tubing, accomplish a broader recognition of this new raceway. Two new sections cover wireways and busways and auxiliary gutters. These, together with the existing Section 515, bare busbars and risers, were made necessary by industrial development and the practically universal use of electricity for power purposes.

Many changes were made in Article 8, automatic overload protection of circuits and appliances. These involved a rather complete structural revision of the chapter. Section 808, covering motors and circuits, has been materially revised. New subdivisions apply to feeders of motor branch circuits and to secondary circuit conductors for wound-rotor alternating-current motors. Recognition of demand or diversity where more than one motor is involved is amplified by specific suggestions. Detailed provisions for conductor sizes and automatic overcurrent protection of conductors and motors have been modified in many respects.

Improvement in the correlation and cross-referencing of Article IX on grounding, have been made and changes in Section 906, grounding portable equipment, effect better protection in portable appliances at voltages higher than 150 and in permanently moist locations.

Article XI, transformers and capacitors, contains a new sub-paragraph to Section 1102 calling for name-plate data on transformers and capacitors.

A complete new text for Article XVIII, storage batteries, is provided.

Section 1901 of Article XIX, lighting arresters, is completely revised and made applicable to industrial stations.

An analysis of the 1931 revision of the National Electrical Code, complied by A. L. Abbott and containing in detail all of the differences between the 1930 and the 1931 editions, has been published for sale by the National Electrical Manufacturers' Association as publication number 31-11, August, 1931.

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Control Equipment Order

The Westinghouse Electric & Manufacturing Company has received an order from the Mercury Manufacturing Company for ten control equipments for industrial storage-battery trucks. These control equipments consist of a master switch and a panel on which are mounted individual contactors for making and breaking the circuit from the battery to the motors. The small master switch is used to operate the control circuit to the contactors.

One of the features of this equipment is the reversing of the motor which is handled entirely by contactors, thus

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ONE OF WORLD'S LARGEST GENERATORS

A small part of one of the world's largest hydro-electric generators in process of construction in the Schenectady Works of the General Electric Company. The three sections form half of the stator frame for one of these 77,500-kva. generators. The weight of a complete stator with punchings and windings is 352,000 lb.

eliminating a large drum reverser. The contactors are very positive in their action, it is claimed, and insure a quick make and break in the circuit, eliminating the burning which is inherent in the old-style drum control.

Contactor control is available for use on storage-battery trucks in all kinds of service, whether the small industrial truck or the large street truck.

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TRADE BRIEFS

John S. Bleeker has been appointed manager of sales of the Lukenweld, Inc., division of the Luken Steel Company, Coatesville, Pa.

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Synthane Corporation, Oaks, Pa., has appointed the Industrial Products Sales Corporation distributor for St. Louis and surrounding territory. H. Douglas Stier has been appointed distributor in Alabama and Georgia by the Synthane Corporation.

•

National Electric Products Corporation, Pittsburgh, Pa., has opened an office at 400 Potrero Avenue, San Francisco, with H. J. Newton, formerly division sales manager for the company with headquarters in Pittsburgh, as Pacific Coast manager.

•

Pennsylvania Railroad has given the Delta Star Electric Company an order exceeding $150,000 for manual and group-operated disconnecting switches.

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D. J. Quammen has been appointed manager of the Philadelphia district office of Cutler-Hammer, Inc. F. J. Burd is now assistant manager of the Chicago office.

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Destroy Plants—but Not Good Will

EVERY one has bad mornings, hates to hear the telephone ring, or to see the office door open. I beg of you, gentlemen, when next you meet such a morning, take a stick of dynamite and blow up one of our plants. But do not take it out on a customer of General Electric. We can replace the plant you have destroyed; we know its value; we have a reserve from which we can rebuild. But we cannot measure the good will you have destroyed and we can never know if we have replaced it. —OWEN D. YOUNG, *addressing a group of General Electric Company employees.*

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New York Metal Prices

	Sept. 2, 1931 Cents per Pound	Sept. 9, 1931 Cents per Pound
Copper, electrolytic	7½	7½
Lead, Am. S. & R. price	4.40	4.40
Antimony	6.60	6.50–6.60
Nickel, ingot	35	35
Zinc, cpots	4.15	4.15
Tin, Straits	26.70	25.75
Aluminum, 99 per cent.	23.30	23.30

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EXPORTS OF ELECTRICAL EQUIPMENT (PRELIMINARY)

Article	July 1930	July 1931
Generators:		
Direct-current—		
Under 500 kw	29,592	17,516
500 kw. and over	48,850	.....
Alternating current—		
Under 2,000 kva	21,086	37,973
2,000 kva. and over	89,347	.....
Steam turbine generator sets	188,541	63,610
Accessories and parts for generators	76,045	35,066
Arc welding sets	33,095	33,466
Self-contained lighting outfits	52,542	46,780
Batteries:		
6-volt storage batteries	160,075	157,695
Other storage batteries	94,102	42,734
No. 6 dry-cell batteries	48,906	29,101
Flashlight batteries	227,098	174,000
Radio B and C batteries (dry)	56,631	30,008
Other dry-and wet-cell primary batteries	16,830	7,561
Transforming or converting apparatus:		
Power transformers, 500 kva. and over	156,981	2,859
Distribution transformers, less than 500 kva	130,375	17,713
Instrument transformers	20,999	3,934
Other transformers	80,167	26,739
Complete battery chargers under 15 amp	11,561	3,116
Double-current and motor generators, dynamotors, synchronous, and other converters	57,328	123,483
Transmission and distribution apparatus:		
Switchboard panels, except telephone	100,060	100,025
Power switches and circuit breakers over 10 amp	161,959	40,817
Fuses	30,230	14,558
Watt-hour and other measuring meters	62,961	37,562
Electrical indicating instruments	64,566	32,347
Electrical recording instruments	29,387	25,570
Other electrical testing apparatus	84,877	47,811
Lightning arresters, choke coils, reactors, and parts	54,983	65,815
Motors, starters and controllers:		
Motors, ½ hp. and under	225,120	123,667
Motors, over ½ and under 1 hp	73,117	36,242
Stationary motors—		
1 to 200 hp	194,104	125,398
Over 200 hp	41,069	29,680
Railway motors	2,512	49,042
Electric locomotives—		
Railway	14,415	.....
Mining and industrial	39,444	43,470
Station and warehouse electric motor trucks	33,583	24,573
Starting and controlling equipment—		
For industrial motors	159,837	104,168
For electric railway and vehicle motors	13,091	15,573
Portable electric tools	127,063	70,193
Accessories and parts for motors	181,514	139,233
Electric refrigerators and parts:		
Household	581,940	537,703
Commercial up to 1 ton	156,160	157,793
Parts for electric refrigerators	.....	266,730
Electric appliances:		
Electric fans	55,872	33,563
Electromechanical health exercisers	9,166	2,564
Electric incandescent light bulbs—		
For automobiles, flashlights, and Christmas trees	14,828	18,725
Other metal filament bulbs	77,004	60,690
Other electric lamp bulbs	10,281	5,379
Flashlight cases	94,044	42,612
Searchlights and floodlights	48,891	10,737
Electric household washing machines	99,251	69,309
Electric domestic vacuum cleaners	134,061	120,503
Other domestic motor-driven devices except tools	96,931	35,158
Electric flatirons	15,137	11,702
Electric cooking ranges	22,172	29,412
Other domestic heating and cooking devices	64,010	37,810
Industrial electric furnaces, ovens and other heating devices	33,663	266,321
Therapeutic and X-ray apparatus	103,124	103,782
Signal and communication devices:		
Radio apparatus—		
Transmitting sets, tubes, and parts	36,021	79,029
Receiving sets	781,663	951,263
Radio receiving tubes	167,685	165,633
Receiving-set components	322,324	283,145
Loudspeakers	113,793	81,193
Other receiving-set accessories	81,051	46,604
Telegraph apparatus	78,565	77,658
Telephone apparatus—		
Telephone instruments	26,207	17,811
Telephone switchboards	119,056	7,710
Other telephone equipment	232,858	94,747
Bells, buzzers, annunciators, and alarms	21,777	20,338
Other electric apparatus:		
Spark plugs	135,429	197,204
Other starting, lighting, and ignition equipment	86,709	81,798
Insulating material	78,923	40,114
Metal conduit, outlet, and switch boxes	77,282	51,838
Sockets, outlets, fuse blocks, and lighting switches	147,845	122,538
Electric interior lighting fixtures	126,869	122,460
Electric street lighting fixtures	42,604	17,389
Other wiring supplies and line material	127,243	67,627
Other electrical apparatus n.e.s	936,899	371,901
Rubber and friction tape	36,421	26,764
Globes and shades for lighting fixtures	41,373	25,772
Glass electric insulators	9,086	6,907
Electrical porcelain:		
For less than 6,600 volts	33,843	12,319
For 6,600 volts and over	37,191	94,088
Carbons and electrodes:		
Electrodes for electric furnaces	122,438	107,034
Other carbon products	53,320	37,698
Insulated iron or steel wire and cable	8,436	10,170
Copper, bare wire	172,359	38,625
Insulated copper wire and cable:		
Rubber-covered wire	62,887	44,349
Weatherproof wire	43,096	13,970
Telephone cable	23,806	7,479
Other insulated copper wire	225,280	124,402
Nickel-chrome electric resistance wire	.....	32,390
Totals	$9,520,917	$7,269,833
Seven months ended July 31	$81,094,136	$57,764,229

Market Conditions

THE week's totals in electrical equipment orders were greatly reduced by the holiday period and buying in virtually all sections of the country is reduced. Orders in the Eastern district are at a low level, reflecting both the normal slackness and the effect of the holiday. Specialties in the appliance field and refrigerators are more in demand, but heavy equipment volume has fallen to an unusually low level.

——NEW ENGLAND DISTRICT MARKS the one outstanding exception of the week, with a substantial rise in volume of sales in many lines, reversing the trend of the last few weeks.

——THE MIDDLE WEST AND PARTS OF THE PACIFIC COAST reflect slight improvement in volume, but no material change has taken place from the trend of recent weeks.

——CERTAIN EVIDENCES OF SHARP PRICE CUTTING are reported from various parts of the country as a result of the unusually keen competition for business.

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PACIFIC COAST

—A GROUP OF HOLIDAYS, *national and state, has interfered somewhat with the routine of orders, but not with their volume, which is still very low.*

—POWER COMPANIES *have ordered several scattered carloads of poles and crossarms, but pole line hardware tonnage is negligible and plants supplying it are running less than half time.*

Interesting machinery orders cover 15,000 worth of transformers for Los Angeles, a carload of Westinghouse refrigerators valued at $19,000 for San Francisco, a $3,500 switchboard for Alameda and $15,000 worth of motors for the Hoover Dam Excavation. School construction, heavy during vacation, has dropped with school opening, but San Francisco will vote on $6,000,000 school building bonds in November and the Catholic Church is to build about $3,000,000 of schools, largely in the bay area. Another comprehensive program announced covers $5,000,000 worth of state projects, including prisons, hospitals, armories and schools.

Government requisitions are heavy, recent orders including 2,500 worth of vacuum tubes, 175 fans, laundry machinery equipment, flashlights and batteries. Los Angeles orders are also good, including a twelve-month contract on 6- and 10-pin crossarms. Insulators, line pins and heavy power 9- and 11-ft. crossarms, besides a $25,000 twelve-month contract on park leaded and varnished cambric cable. About three carloads of rubber-covered wire in San Francisco and miscellaneous cambric cable for Los Angeles are also to be placed soon. The week's outstanding order covers $50,000 worth of Westinghouse cubicles for Portland.

In accordance with terms of sale of 15,000 bush. of wheat in the form of flour to China for famine relief concluded by the Federal Farm Board recently, Seattle and Pacific Northwest millers expect to receive this week specific orders for the first consignment of 7,500,000 bush., this activity assuring employment until next March of 15,000 men. The State Highway Department at Olympia is taking bids until September 29 for installation of a lighting system on Aurora Avenue bridge in Seattle, the work involving 128 light posts complete, five transformers, fifteen oil fuse cutouts, 8,000 ft. of lead-covered cable and 37,000 ft. of rubber-covered cable. Board of Public Works, Seattle, opened bids for 25,000 lb. of No. 4/0 bare copper wire, seven-strand, on 2,000-lb. reels. A contract for furnishing a switchboard and panelboards for Weyerhauser pulp and paper plant being constructed in Longview, involving about $60,000, was secured by Westinghouse. Motor and transformer sales reported last week involved 75 machines from ½ to 150 hp. to pulp and paper and lumber mills, mainly for replacements: miscellaneous industrials and orchard districts in eastern Washington, 40 motors to miscellaneous small industrials, ten motors from 50 hp. down to mines, twenty machines from 50 hp. down, mainly 10s, 15s and 25's, to mills and mines, three 50-kva., two 30-kva. and fifteen 5-kva. transformers to central stations and about $2,000 worth of miscellaneous switchgear.

CONSTRUCTION PROJECTS

Department of Water and Power, Los Angeles, Calif., has plans nearing completion for third unit of municipal hydro-electric power plant in San Francisquito Canyon, to increase capacity by 18,000 hp., estimated to cost $1,000,000. Construction Quartermaster, United States Army, Alameda, Calif., is completing plans for air depot on local field, including hangar, shops, administration building, power house and other units, to cost $743,000. Columbia River Power Company, Portland, Ore., has made application for federal permit for a hydro-electric generating plant on Columbia River, near Stevenson, Wash., to cost close to $10,000,000, including steel tower transmission line.

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SOUTHEAST

—THE VOLUME OF BUSINESS *in the Southeast does not reflect any change in general conditions. A fairly steady volume of small orders is being maintained, but no individual orders of moment were reported this week and few are in prospect at this time.*

—KILOWATT-HOUR SALES *of one of the largest power companies in this section indicates that last month textile mills were running about 5 per cent ahead of what they were in August, 1930.*

A power company in Georgia ordered last week $8,100 worth of bare and weatherproof copper wire and $3,800 worth of creosoted pine poles and crossarms. Wesleyan College, in the same state, ordered $3,000 worth of wire and cable for system changes on the campus. The Georgia power company has just completed a six weeks' campaign on electric ranges and water heaters and 966 units were sold.

CONSTRUCTION PROJECTS

Danville, Va., will receive bids until September 22 for armory and auditorium to cost $150,000. Construction Quartermaster, Langley Field, Hampton Roads, Va., will receive bids until September 25 for two equipment storage and distributing buildings on local field. State Board of Education, Nashville, Tenn., has plans for an industrial arts school to cost $135,000. Lake Wales Citrus Fruit Growers Association, Lake Wales, Fla., plans packing plant to cost over $100,000.

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SOUTHWEST

—WHILE NOTHING STARTLING *has developed in general business conditions, there has been a good, steady demand for the stock sizes and a few orders are being placed by the power companies for apparatus to carry the additional load of the approaching season.*

The following orders have been reported: Equipment for a "White Way" for Missouri city costing $8,000, miscellaneous orders including meters worth $5,000, induction voltage-regula-

tors, $2,000, and distribution transformers, $3,000.

CONSTRUCTION PROJECTS

Department of Agriculture, Washington, D. C., has approved construction of Forest Products Laboratory at Madison, Wis., at cost of $727,648. Dow Chemical Company, Midland, Mich., plans magnesium alloy plant to cost over $300,000. Copper District Power Company, Calumet, Mich., contemplates hydro-electric generating plant on Lake Gogebic, to cost more than $400,000. Wabash Railroad Company, St. Louis, Mo., and Nickel Plate Railroad, Cleveland, Ohio, plan new yards and terminal buildings at Toledo, Ohio, to cost $1,000,000.

EASTERN

—IF THE ELECTRICAL *equipment market in the Eastern district sought further excuse for dullness, it was found in the week-end holiday just past, which went to taper sales to an extremely low level. Heavy machinery has reached a valley from which it will require some time to emerge, with immediate outlook for revival none to encouraging.*

—THE CURRENT TREND *is toward specialty account, if such it can be termed, with refrigerators, electrical appliances, floodlighting apparatus and similar electrical products engaging under improved demand. Intensive competition is responsible for a number of ills in the industry, and not least among them, the acceptance of volume business at prices approximating, if not below, actual cost; even the larger manufacturers of equipment are susceptible, and it is making indefinite market stability, hard to correct.*

A New York manufacturer will furnish transformers and auxiliary equipment for a central station on Long Island, totaling $35,000. Three bidders have tendered figures for power equipment for a project of the Sewerage Commission at Milwaukee, Wis., the low figure coming from the Dravo-Doyle Company, at $27,900. Allis-Chalmers Manufacturing Company has taken an order for turbine machinery for a project of the Passaic Valley Water Commission, Paterson, N. J., including generator and accessories, at $94,600.

Four bidders tendered figures to the Post office Department, Washington, D. C., for 300 fractional-horsepower motors, the Doubleday-Hill Electric Company being low; there was a differential of only 30 cents each in the quotations of the low and high bidders. The Panama Canal Bureau, Washington, D. C., has secured eight bids for the construction of the Madden dam for its hydro-electric power project in the Canal Zone, with low figure from the F. W. E. Callahan Construction Company, St. Louis, associated with Peterson, Shirley & Gunther, Omaha, Neb., at $4,047,407; the top price submitted for the work was $6,281,580. Bids are now being requested for electrical and hydraulic machinery for this project, closing October 14. Architect's office, United States Capitol, Washington, has a low bid from Collier Construction Company, Cleveland, Ohio, for a street and park lighting system, at $86,452; the high bidder, among a group of nine, entered a quotation of $129,000.

CONSTRUCTION NEWS

Signal Supply Officer, Signal Corps, United States Army, Army Base, Brooklyn, N. Y., will receive bids until September 22 for 108,000 ft. of wire (Circular 18); also, at same time, for insulators and capacitors (Circular 19). Board of Education, New York, will soon begin construction of multi-story vocational and continuation school at Richmond, S. I., to cost over $1,000,000. Sinclair Refining Company, New York, contemplates extensions and improvements in oil refining plant at Fort Worth, Tex., to cost over $1,000,000. United Lead Company, New York, is reported planning new plant at South Amboy, N. J., for a subsidiary interest, to cost in excess of $250,000. Department of Institution and Agencies, Trenton, N. J., has completed plans for aircraft hangar with shop facilities at Newark airport, Newark, N. J., to cost close to $85,000; also, has plans for two industrial buildings at State Prison Farm, Bordentown, N. J., to cost over $200,000. Department of Commerce, Washington, D. C., will receive bids until September 15 for 50 3-kva. alternators, with starting battery, etc. (Proposal 23688). General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until October 14 for electrical and hydraulic machinery for Madden power plant, Panama (Schedule 2685).

MIDDLE WEST

—SOME SLIGHT IMPROVEMENT *in general business was observed this week in the Middle West section. The volume of business remains quite constant and indications seem to point to greater activity this month.*

Wholesale and retail mercantile trade has received some stimulation from cooler weather and the opening of school. The various utility companies continue purchasing for the most part for their immediate needs. There has been a little better demand for distribution materials and some apparatus is being placed. Some of the interesting orders placed this week include one 75,000 kva., 12,600-volt, three-phase, 60-cycle, horizontal, totally inclosed, air-cooled synchronous condenser complete with main and pilot exciters, four 50,000-kva., oil-insulated, self- and forced-air-cooled, single-phase, 60-cycle, 127-kv. transformers, four 50,000-kva. output regulating transformers and several construction orders aggregating $75,000.

CONSTRUCTION PROJECTS

Kansas City Power & Light Company, Kansas City, Mo., has plans for power substation to cost over $60,000. Construction Quartermaster, United States Army, Fort Riley, Kan., plans call for bids for hangar, power house and other buildings to cost about $85,000. Public Service Co. of Oklahoma, Tulsa, Okla., and Oklahoma Power & Water Company, Sand Springs, Okla., will build 66,000-volt transmission line between Sand Springs and Tulsa. Humble Oil & Refining Company, Houston, Tex., contemplates oil refining plant near Kilgore, Tex., to cost over $300,000; a similar plant is also proposed at Gladewater, Tex., to cost about $400,000.

NEW ENGLAND

—REVERSING A PREVIOUS TREND, *last week's movement of electrical supplies and equipment showed a strong rise in sales, according to a number of prominent manufacturers. Outstanding in demand were small motors, which moved in fairly large lots; also fractional-horsepower motors, which continue in steady demand by manufacturers of oil-burning equipment and electric refrigerator manufacturing companies.*

—ENCOURAGEMENT IS GIVEN *by considerable improvement in the trend of negotiations on hand, which, according to one well-known manufacturer's representative, is better at present than a year ago.*

Included in the wide range of inquiries are turbo-generators, usually of small capacities, one of which, including complete control apparatus, will soon be ordered by the state of Massachusetts for one of its penal institutions, and some increase in inquiries for central-station materials. On the other hand new construction materials are slowing up in activity and merchandising is spotty, though an appreciable gain in sales of electric water heaters is reported by one manufacturer, and appliance sales reported by one group of stations show a steady demand.

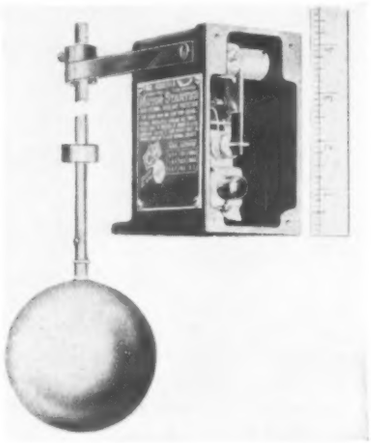
CONSTRUCTION PROJECTS

New England Fuel & Transportation Company, Everett, Mass., has filed plans for additions to plant to cost $75,000. Tropical Radio Telegraph Company, Boston, Mass., has secured permission to construct a broadcasting and receiving station at Nassau, Bahama Islands, to cost $85,000. L. G. Balfour Company, Attleboro, Mass., has filed plans for addition to jewelry factory, including power station, to cost about $125,000.

New Equipment Available

Float-Operated Motor-Starting Switch

FOR SMALL A.C. AND D.C. MOTORS on cellar drains, open tanks and similar application the new float-operated motor-starting switch announced by Cutler-Hammer, Inc., Milwaukee, Wis., provides across-the-line starting, thermal overload protection and is small in size. For larger motors this same device can



be provided without overload protection, so it can be used as a master switch in the control circuit of a separate automatic starter. It can also be furnished without the float accessories for use as a lever-operated master switch.

Maximum ratings for this float-operated motor starter are: alternating current, ½ hp., 110 or 220 volts, single phase; direct current, ¼ hp., 115 volts.

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Proportioning Motor Control System

WHAT IS CLAIMED TO BE a radically different control system from any existing is announced by the Minneapolis-Honeywell Regulator Company, Minneapolis, Minn. The apparatus incorporates a combination of two parts, the electrical transmission system and the associated power unit, which can be adjacent to or remote from the controlling instrument. A mechanical interconnection is required between the power unit and the electrical balancing mechanism. Transmission operates on the Wheatstone bridge principle.

The power unit, inherently a motor-driven speed reducer, causes its drive shaft to take a new position whenever the conditions under control, such as temperature, change slightly. If a device such as a valve, or valves, louvers or rheostats are driven by the motor, then their operation tends to correct the change and a condition of equilibrium is approached. The apparatus may be used in conjunction with practically all types of control instruments.

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A COMPLETE LINE OF TEST CLAMPS, designated "Kliplok," has recently been placed on the market by the Trico Fuse Manufacturing Company, Milwaukee. These test clamps have been especially designed for accurate testing work, although they can be used for general applications such as making temporary connections, battery charging, signal inspecting, meter and motor testing and other shop laboratory tests. The jaws are actuated by the turning of a molded knob. All metal parts are cadmium plated to resist rust and acid. The clamps are made in four sizes, rated 0-30 amp., 30-75 amp., 75-150 amp., and 150-300 amp.

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Multi-Contact Making Pressure Gages

A MULTI-CONTACT-MAKING pressure gage for use with supervisory control system to indicate certain pressure readings at a remote point has been announced by the Westinghouse Electric & Manufacturing Company. It was developed for use with a pipe line pumping station to give remote indications of intake and discharge pressures. Ten adjustable contacts are placed at predetermined intervals over the scale of the pressure gage. When the pressure changes sufficiently to make a new contact, a code of impulses is sent over the supervisory control wires to indicate the change to the dispatcher. Thus all changes are automatically sent through without the use of extra live wires. The indicating contacts have a capacity of 5 amp. at 125 volts. The device is usually made for storage battery operation.

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Quick-Break Gang-Operated Switch

A QUICK-BREAK, GANG-OPERATED SWITCH has been announced by the James R. Kearney Corporation, St. Louis, Mo. It is being made in two-, three- and four-pole gangs and can be operated with a simple disconnect puller if desired. The operating mechanism can be furnished for those who require it. Connections to the line are made with Kearney solderless wire connectors, eliminating the soldered lug connection. The disconnect blade rolls out of the contacts with a wrist-like motion under high leverage, breaking any ice or dirt seal. When the blade leaves the contacts a completely inclosed helical spring opens the blade with high velocity.

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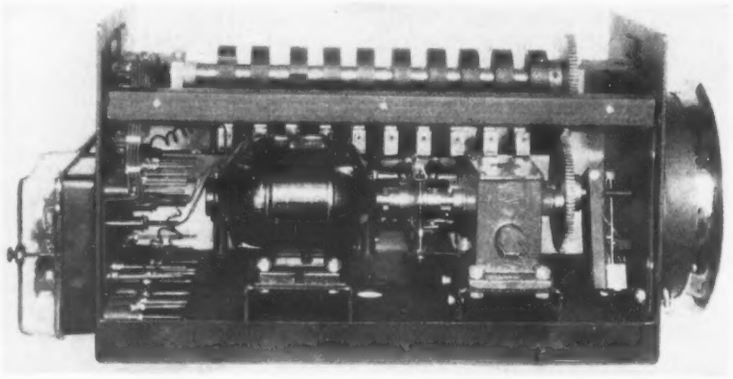
Wire Measuring, Cutting and Stripping Machine

A HIGH PRODUCTION COMBINATION measuring, cutting and stripping machine for long length cords and wires has been developed by the Artos Engineering Company, Milwaukee, Wis. The machine is adjustable for any length from 12 in. minimum to 20 ft. maximum. Stripping length is adjustable from ¼ in. up to 2 in. on either end. Production capacity is 1,800 pieces per hour for lengths from 12 in. to 10 ft. and 900 pieces per hour for lengths from 10 ft. to 20 ft. The machine will handle single-conductor wires, two-conductor heater cords, parallel conductor lamp cords and multiple-conductor service cords. On heater cords and lamp cords an attachment can be used whereby the outer braiding is removed from the cord a certain predetermined distance back from the stripped conductors.